PB-230 870

THE PILOT SOLID WASTE DATA ACQUISTION AND ANALYSIS SYSTEM

Martin Marietta Corporation
Orlando, Florida

August 1971

DISTRIBUTED BY:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 230 870

FINAL REPORT ON
THE PILOT SOLID WASTE DATA
ACQUISITION AND ANALYSIS SYSTEM

DEVELOPED UNDER CONTRACT
CPE 70-131

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

PREPARED BY
MARTIN MARIETTA CORPORATION
ORLANDO, FLORIDA

AUGUST 1971

194

ACKNOWLEDGEMENTS

The author wishes to express his gratitude to Mayor Carl B. Stokes of Cleveland, Ohio; to Mayor Ralph E. Christman of North Olmstead, Ohio; to Mayor Kenneth Hill of Wichita Falls, Texas; to Mayor Erwin F. Soell of Iowa Park, Texas; to Mayor Carl Langford of Orlando, Florida; to Mayor Homer Hough of Maitland, Florida; and to their administrators for their cooperative efforts in this program.

Particular thanks are due to Commissioner Robert Beasley, who spent uncounted hours helping and eventually adopting the author as a part of his organization; to Henry Caster, the director of services in North Olmstead, Ohio, who, in spite of the burden imposed by having just taken over the operation in North Olmstead, still found time to discuss the system and make recommendations for its operation; to Jeff Chancey of Wichita Falls, Texas, who willingly contributed the experience that he had gained in implementing probably the most sophisticated solid waste data system in existence; to Walter West of Burkburnett, Texas, who did everything from collecting data himself to assisting in characterizing the samples; to Mr. K. G. Wilkes, the city secretary in Iowa Park, Texas, who made all of the arrangements and furnished the data promptly and accurately at the end of each week; to Mr. Dick Cobb of Orlando, Florida, who tolerated several false starts and delays and still cooperated to the utmost degree; to Mr. George Marcus of Maitland, Florida, who used portable scales to obtain weights because no commercial scales were available; and to Mr. George Hardy of Central Service Corporation in Orlando, who freely and willingly contributed the experience gained through many years of routing. It is the hope of the author that this is the beginning of a system that will prove extremely beneficial and helpful to all who contributed their efforts and to the many others who are associated with the collection and disposal of solid waste.

TABLE OF CONTENTS

Page

Summary and Conclusions iv

Introduction 1

Development of the Pilot System 3

Disposal Facilities.................... 31

Characterization Studies.................... 38

Deal With Communities.................... 41

Results.................... 43

Concept for Implementation of the National Data Network.................... 47

Recommendations.................... 65

SUMMARY AND CONCLUSIONS

Summary

During the period July 1, 1970 to June 30, 1971, the Bureau of Solid Waste Management* (BWSM), working with the Martin Marietta Corporation as a contractor, developed and tested a pilot data acquisition and analysis system for solid waste management. The objective of this pilot study was to prove the feasibility of and establish the methodology for collecting and analyzing data from operating solid waste management systems for input into a National Solid Waste Data Network (NSWDN). The purpose of the full-scale Data Acquisition and Analysis System will be to continually collect, analyze, and supply management data from typical solid waste management systems to (1) facilitate system planning and selection by local governmental and private agencies, and (2) guide technical assistance and policy formulation activities at the Federal and state levels.

Development of the pilot data acquisition and analysis system involved first identifying potential data users, information needs, practicable system outputs, and data input elements necessary to produce these outputs. Procedures were then established for collecting, processing, and reporting the input data. Finally, the data acquisition and analysis system was tested by collecting data from selected, diverse solid waste management systems over a 6-month period.

Three Standard Metropolitan Statistical Areas (SMSA's) were chosen as data sources for the pilot system. These SMSA's (Cleveland, Ohio; Wichita Falls, Texas; and Orlando, Florida) were chosen on the basis of wide variations in climate, socio-economic patterns, population characteristics, types of solid waste management systems, and sophistication of solid waste management information systems. Within these SMSA's, a total of 12 residential solid waste collection routes was selected to represent a wide range of residential population density, average family income, and route management structure (central city vs. suburbs, private collector vs. municipal operation, etc.). Daily reports of waste collection activities on these routes were obtained. Two landfills and one incinerator were also studied.

---

*This organization is now the Office of Solid Waste Management Programs, U.S. Environmental Protection Agency.

Data collected from these sources over a 6-month period was entered into an IBM 360-50 computer, processed, and summarized into reports detailing collection route characteristics, vehicle and crew characteristics, time expenditures on collection activities, and equipment and manpower costs for route operation. Costs of landfill and incinerator operation were also determined.

Conclusions

Conclusions drawn as a result of this pilot study are as follows:

1. A national solid waste data network featuring a data acquisition and analysis system for collecting and processing technical data for operating solid waste management systems will be extremely useful to the Bureau and to managers of solid waste management systems.
2. The development of a data acquisition and analysis system on a national level in the manner suggested in this report is feasible from the standpoint of data utility, availability, and estimated system cost.
3. The Bureau should begin at once to implement the orderly expansion of the pilot system into the national solid waste data acquisition and analysis system involving 30-50 SMSAs as described in the concept of implementation in this report.

4. The teaming arrangement of the Bureau of Solid Waste Management and a contractor in the development of the pilot program proved effective and efficient. It provided the cross checks so necessary in developing a large data system. This same arrangement can be most effectively utilized during the implementation and operation of the total national system. If a contractor is to be used in the implementation and operation of the national program, he can most efficiently perform the services of gathering, validating, processing, and analyzing the data. The Bureau's responsibility should be that of directing the program, soliciting cooperation from potential project participants, answering all inquiries regarding the system, coordinating all data dissemination, analyzing and interpreting the collected data and providing a cross check on operation and data to assure data validity. This validity along with system stability are of the utmost importance in the implementation and operation of a large data system. Rapid change of organizational philosophy or key personnel can damage or destroy the data system.

INTRODUCTION

Statement of Problem

Solid waste management has been plagued by lagging technology, high cost, pollution hazards, and public criticism. Much effort has been exerted in attempts to improve solid waste management practices in the United States. However, these efforts have suffered from a dearth of reliable and standarized technical data and the absence of a suitable mechanism for disseminating data when available.

To understand the nature of solid waste management and its associated problems, it is necessary to know the cost of solid waste systems and the amounts of solid waste which must be handled. Few communities have this information and yet these values will influence the type of disposal best suited for a community, influence the type of collection practices, and assist in establishing plans for more sophisticated long-range disposal practices.

The National Survey of Community Solid Waste Practices was conducted by the Bureau of Solid Waste Management in 1967-70 to document at one point in time existing solid waste management practices and to define the magnitude of the national solid waste management problem. Demands for information from this survey have substantiated the need for a national system for continuously collecting, analyzing, and disseminating technical data to relate solid waste management system configurations with the associated costs.

To satisfy this need, the feasibility of establishing a Data Acquisition and Analysis System for continual surveillance of solid waste management has been studied. This system, if established, would collect data on solid waste characteristics, waste generation rates, system and subsystem operations, and solid waste handling costs.

The full-scale Data Acquisition and Analysis System would be designed to feed data into a larger National Solid Waste Data Network which would also incorporate data from BSWM contracts, grants, and other data sources. Objectives of the total system include:

1. Provide design and planning data to those persons in the public and private sectors concerned with solid waste management.
2. Determine trends in solid waste characteristics and quantities.
3. Evaluate the effectiveness of national and local solid waste management programs in achieving local improvements.

Approach

During the period July 1, 1970 to March 31, 1971, BSWM contracted with the Martin Marietta Corporation, Orlando (Florida) Division, to assist in developing a Data Acquisition and Analysis System on a pilot scale. The contractor was required to work closely with BSWM in developing a system that would prove the feasibility of collecting and processing data pertaining to solid waste generation, characterization, and management systems, and processing the data into meaningful results by:

1. Developing a concept for the national network.
2. Developing a pilot system that would collect and process the data from four residential collection routes in each of three SMSA's.
3. Sampling at least one disposal or treatment facility for operating and capital costs, operating characteristics, and environmental effects.
4. Characterizing the waste from each of the SMSA's.
5. Dealing with communities from which the data is gathered to develop an adequate method of reimbursement for the expenditures that the communities incurred by participating in the program.

The contractor was left with a wide latitude for decision making although it was specified that he work closely with BSWM and that BSWM would have the right and responsibility for approving or disapproving major decisions. It was stated and clearly understood by both parties that the development effort would be concerned with residential solid waste management only. Facilities were to be monitored for environmental effects, such as vectors, litter, traffic impact, and other factors which might be offensive to the general citizenry.

DEVELOPMENT OF THE PILOT SYSTEM

Solid waste management systems consist of (a) personnel--engineers, planners, department managers, consultants, foremen, machine operators, laborers, etc; (b) equipment--trucks, tractors, sweepers, railroad cars, barges, bulldozers, etc; and (c) facilities--transfer stations, incinerators, open dumps, sanitary landfills, vehicle garages, etc. These systems may be operated in whole or part by cities, counties, franchised private collectors, and unlicensed collectors.

In attempting to solve the fundamental problem of data scarcity concerning solid waste management systems, BSWM decided that pertinent data from typical systems should be gathered, manipulated, and presented in a useful, readily accessible form. However, to avoid the proliferation of inevitable developmental errors and misjudgments and to minimize the consequences of resulting system modifications, BSWM undertook development of the Data Acquisition and Analysis System on a limited scale. The development of this pilot system is discussed from the standpoint of information management in the following pages.

Minimization of Data Handling Problems

A basic requirement in developing a Data Acquisition and Analysis System for solid waste management is a clear and complete understanding of the factors which influence solid waste generation, collection, transportation, processing, and disposal. The complexity of solid waste systems presents one of the major potential problems in establishing data systems--that of being swamped with data that are meaningless. In any such endeavor, the key to success is careful control of quantity and type of input data. Too little input data would result in a system that is incapable of producing conclusions; too much data would result in a system that is cumbersome and costly to operate. Therefore, possible output combinations should be drastically reduced by selecting the minimum number of factors which will provide meaningful information.

Another problem commonly encountered with data system development is inefficiency in data handling, caused by insufficient attention to information entry and storage methods. These procedures control the accessibility of individual data elements, thus affecting the time and cost required to evaluate a given combination of parameters.

To control these problems, it was decided to produce specific data for specific users. To determine input data requirements, the data outputs should be specifically defined. The input data elements required to calculate only the defined outputs could then be identified algebraically. In adhering to this concept, it was necessary to initially identify probable users of the data system and to develop outputs which would be useful to them.

Determination of Information Requirements

The processes for determining uses and users of detailed solid waste management system information are closely related and were handled concurrently. The first step made in identifying the uses and users of the Data Acquisition and Analysis System was a literature search. A sample of the documents examined is shown in Table 1. Visits were made to local operators of solid waste management systems, to municipal planning agency, and to the Office of Solid Waste Management Programs in Cincinnati, Ohio. A list of the various agencies and offices contacted is shown in Table 2.

As a result of these visits, the general categories of users were defined as follows:

1. The Bureau of Solid Waste Management

TABLE 1

LITERATURE SOURCES OF INFORMATION

A study of solid waste collection systems comparing one-man crews with multiman crews

Technical-economic study of solid waste disposal needs and practices

Proceedings of 1966 National Incinerator Conference

Proceedings of 1968 National Incinerator Conference

1968 National Survey of Community Solid Waste Practices

Effectiveness of solid waste management programs

An accounting system for collection systems

An accounting system for transfer station operations

An accounting system for incinerator operations

An accounting system for landfill operations

TABLE 2

AGENCIES AND OFFICES CONTACTED

Office of Solid Waste Mangement Programs

Superintendent, Sanitation Department, Wichita Falls, Texas

City Secretary, Iowa Park, Texas

Commissioner of Sanitation, Cleveland, Ohio

Cleveland Planning Commission

Bradbury Associates, private collector

Orlando Superintendent, Waste Collection

Central Services Corporation, Orlando, Florida

2. Planners
    a. State
    b. Regional
    c. Local
3. Operators
4. Manufacturers
5. Consultants
6. Researchers

Table 3 shows some types of information which were considered important by the various potential users.

Later in making contacts to implement the pilot system, it was necessary to discuss these suggested uses with solid waste operators and managers at the local level. As a result of these discussions, the data needs listed in Table 3 particularly at the operational level, were verified.

For example, the Commissioner of Sanitation in Cleveland, Ohio, knew the facts concerning the performance of his system but needed a standard of performance for comparison. This need was later verified in a visit to the Superintendent of Waste Collection in Orlando, Florida. The Cleveland Planning Commission revealed their need for a breakdown of the costs and other resources associated with the operation of a solid waste system. Central Services Corporation, a private collector in Orlando, Florida, was already developing the same data that the Data Acquisition and Analysis System anticipated collecting and using.

After considering the problem of developing a data system for residential solid waste management, it became obvious that limitations on manpower and money available for this project dictated that effort should be concentrated on either collection or disposal and/or treatment. It was decided to concentrate the major effort on residential solid waste collection with a more limited effort on disposal and/or treatment.

TABLE 3

INDICATIONS OF INFORMATION NEEDS

Information Users	Information Needed				
	Priority 1	Priority 2	Priority 3	Priority 4	Priority 5
BSWM	Solid waste quantity	Solid waste composition	System performance	Cost of solid waste act	Land required
Planners: State	Cost of solid waste activities	System performance	Solid waste quantity	Land required	Solid waste composition
Regional	Solid waste quantity	Population	Land required	Cost of solid waste activities	Solid waste composition
Municipal	Solid waste quantity	Cost of solid waste activities	System performance	Land required	Air pollution
Operators	Solid waste quantity	Cost of solid waste activities	Facility performance	Equipment inventory	Air pollution
Manufacturers	Solid waste quantity	Cost of solid waste activities	Solid waste composition	Population	Air pollution
Consultants	Solid waste quantity	Cost of solid waste activities	Solid waste composition	Population	Facility performance
Researchers	Solid waste quantity	Land required	Cost of solid waste activities	System performance	Solid waste composition

A number of reasons directed that this choice be made. Nationwide, the collection operation accounts for about 80 percent of the money spent for all solid waste management activities. Collection has the most direct effect on the citizens being served and therefore on the health and well-being of the community. The BSWM has done some developmental work on information systems for disposal but little for collection. Since disposal and/or treatment is conducted in a fixed location, most communities already keep some type of cost and operating records for these activities. The collection activity, because of the relative independence of the driver and crew, lends itself to a sampling approach to data collection. Thus, data collection efforts for disposal and treatment facilities, though not totally ignored, were given a lesser priority during this pilot study than for solid waste collection.

Identification of System Outputs

In order to develop an adequate data collection and analysis sytem around the collection activity, it was necessary to analyze the complete operation. Figure 1 shows the general sequence followed by a truck and crew in collecting solid waste. The crew meets at the motor pool and rides the truck to the route. Upon arrival on the route, the "loaders" dismount and proceed to empty the contents of the garbage cans into the truck. In most cases, the total waste on the route exceeds the capacity of the truck. If this happens, the truck, upon being filled to capacity, is driven to the discharge point. The truck is then returned to the route and collection is resumed until the truck is again loaded or all of the waste is collected. The truck is again driven to the discharge point, and either is returned to the route for another cycle or is returned from the discharge point to the motor pool, where it terminates the day's activities.

It was decided to measure solid waste collection system performance in terms of cost per ton collected, cost per residence served, and cost per person served.

The quantity of solid waste collected was assumed to be the quantity generated. As shown in Figure 1, the collection system cost could be divided into three categories: the cost of traveling to the route; the cost of collection; and the cost of transporting the waste, including returning to the motor pool after the last load. Factors contributing to these costs were vehicle operating and labor costs, which vary directly with the time required for each of the operations.

This selection of performance criteria led to the requirements for the general outputs shown in Table 4. However, solid waste management system operators had also indicated a need to compare systems so that collection system characteristics affecting system performance were also identified in the output information.

In order to portray the solid waste quantity generated, system performance, and differences in systems, it was decided to group the vehicle and crew output information in one report, the route characteristics in a second report, the cost information in a third report, general operating information pertaining to distances and time in a fourth report, and population information in a fifth output report. As a point of reference for those who would want to compare systems, a sixth report (the summary) was generated. This report shows the length of the route served, the type vehicle used, the frequency of collection, the point from which the waste is collected, the cost per ton, the cost per household served, the cost per person served, and the cost per square mile served. Samples of these outputs are shown in Appendix A. It was felt that these outputs were consistent with the general requirements established in Table 3.

It was felt at the outset of the pilot study that in addition to the computer outputs shown in Appendix A, line charts, bar graphs, and pie charts should also be produced. The line charts would display the variation with time of certain data elements, the bar charts would show comparative values of two or more elements, and the pie charts would show proportional information. Because of the nature of these outputs, they must await the establishment of a data base.

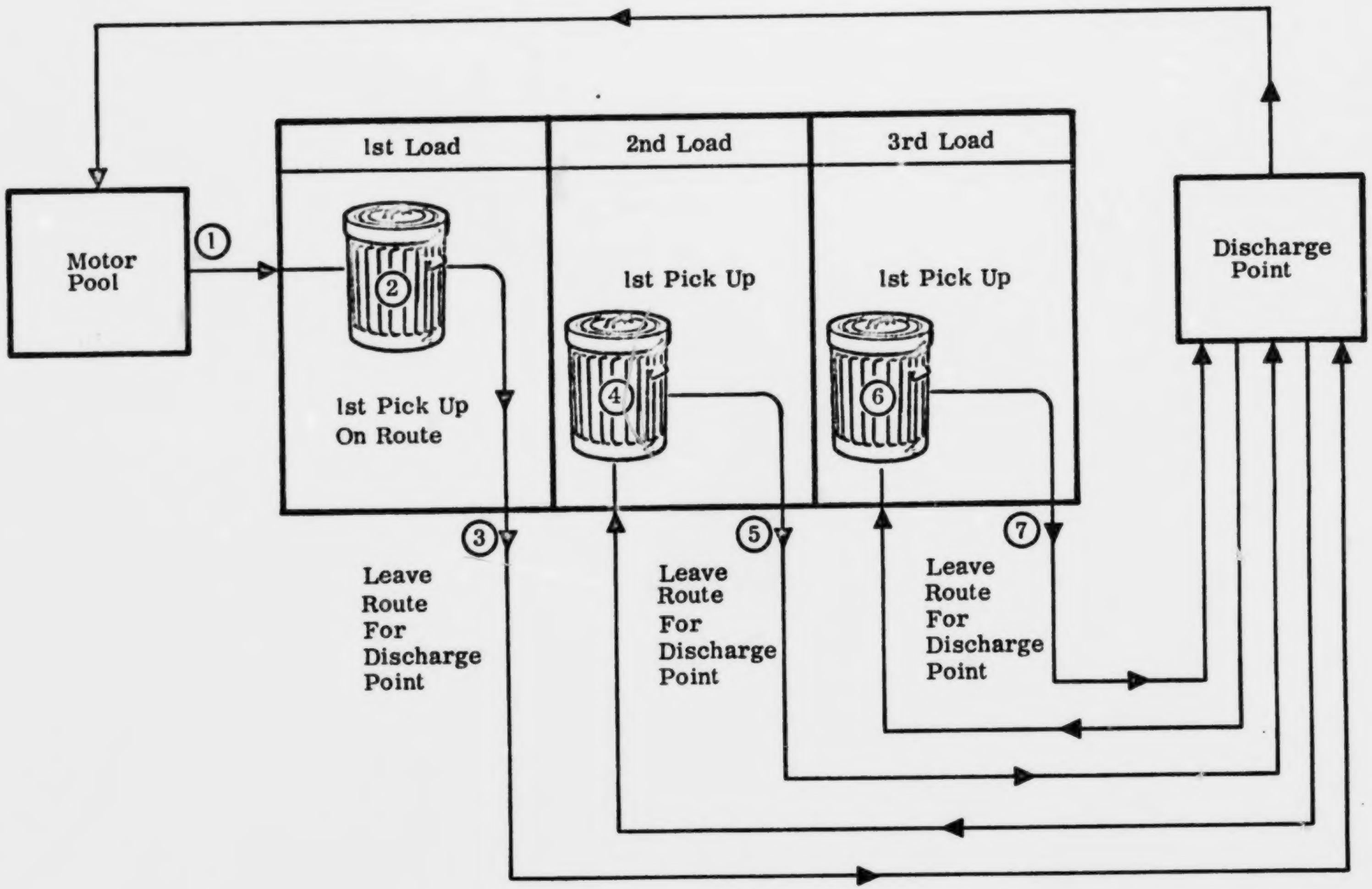

Motor Pool
①
1st Load
2nd Load
3rd Load
②
1st Pick Up On Route
1st Pick Up
④
1st Pick Up
⑥
Discharge Point
③
Leave Route For Discharge Point
⑤
Leave Route For Discharge Point
⑦
Leave Route For Discharge Point

FIGURE 1

TABLE 4

OUTPUTS REQUIRED FROM DATA ACQUISITION AND ANALYSIS SYSTEM

Vehicle-crew detailed report
Route detailed report
Cost breakdown detailed report
Operations detailed report
Population characteristics
Summary report

Identification of Input Data Elements

The inputs required to produce the specified outputs were divided into categories closely paralleling the output reports. Inputs described the vehicle, crew, route, distance, time, weight, and motor pool statistics. Identification of the input data elements is shown in Table 5. The equations used to convert these inputs to the outputs shown in Appendix A are included in Appendix B. Preliminary investigations indicated that all categories of information except the distance, time, and weight usually remained constant for extended periods (i.e., several months). On this basis, it was decided that the "constant" information could be collected one time and verified every several months, a distinct advantage because it decreased the load imposed on the operating system. Of course, the distance, time, and weight data changed daily and had to be collected on a daily basis. Accordingly, forms were developed on which the various input data elements were entered. Data forms for solid waste collection route activities are shown in Figures 2 and 3.

Data Systems Development

The forms on which the information was originally recorded were designed for ease in data gathering and as such were not machine oriented. The constant data shown in Figure 2 and variable data shown in Figure 3 were combined on a loading form and keypunched onto a set of three punched cards. Information entered and the location of the entry on each card are shown in Figure 4 and instructions for obtaining and entering the data are shown in Appendix C. Data received from Wichita Falls, Texas, was in a different format as shown in Appendix D. Instructions used to convert this data are included in Appendix E.

The punched cards were arranged in sets for each route. The sets were inserted and the deck was arranged in order of Environmental Protection Agency (EPA) regions. Information assimilated by the computer consists of 42 data elements as shown in Figure 4. Each of the 42 elements represents one day's information for one route.

TABLE 5

INPUT DATA ELEMENTS

Identification Information

- Region
- SMSA
- City

Vehicle Information

- Type used
- Size
- Cost
- Age
- Life expectancy
- Time used
- Operating cost
- Maintenance cost

Crew Information

- Size
- Classification
- Rate of pay
- Time worked

Route Information

- Identification
- Number of residence served
- Number of people served
- Length of route
- Economic level
- Pickup point
- Discharge point
- Collection schedule
- Area served

Distance Information

- From motor pool to start of route
- From start of route to point where vehicle is loaded
- From point where vehicle is loaded to point of discharge and return to 1st pickup on next load
- From last pickup to discharge point to motor pool

Time Information

(Same as Distance Information above)

Weight Information

- Weight of vehicle
- Gross weight when leaving route for discharge point

Motor Pool Statistics

- Land required for motor pool

ROUTE INFORMATION

REGION				
SMSA				
CITY				
ROUTE NUMBER				
NUMBER RESIDENCIES SERVED				
NUMBER PEOPLE SERVED				
ECONOMIC LEVEL				
LENGTH OF ROUTE				
CREW SIZE				
LAND REQUIRED FOR MOTOR POOL				
NUMBER VEHICLES SERVICED BY MOTOR POOL				
LAND REQUIRED FOR STORAGE AND SERV./VEH.				
CREW CLASSIFICATIONS	NO. ON SHIFT		SALARY RANGE	TIME BETWEEN STEPS
	1	2		
1				
2				
3				
4				
COST OF CREW ACTUAL				
TYPE VEHICLE USED				
SIZE VEHICLE				
CREW SIZE				
COST OF VEHICLE				
VEHICLE AGE				
LIFE EXPECTANCY OF VEHICLE				
DISTANCE FROM VEHICLE STORAGE TO BEGINNING OF ROUTE				
PICK UP POINT				
DISCHARGE POINT				
DISTANCE TO DISCHARGE				
COLLECTION SCHEDULE				
COLLECTION PATTERN				
OPERATING COST				
MAINTENANCE COST				
AREA SERVED				
IS SEPARATION REQUIRED?				
REGULATIONS				

FIGURE 2

CITY ______________ ROUTE ______________ DATE ______________

VEHICLE NO. ______________ GAS ______________ OIL ______________

	Time	Mileage	Weight
Leave motor pool			
Start collection			
Leave route for discharge point			
Weight			
Arrive back on route			
Leave route for discharge point			
Weight			
Arrive back on route			
Leave route for discharge point			
Weight			
Return to motor pool			

Maintenance	Time		Mileage
	Started	Finished	
Wash			
Repair			
Crew Identification			

Name	Classification
a	
b	
c	
d	
e	

FIGURE 3

DATA CARD LAYOUT

ATTACHMENT - 3

CARD NO. 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19	20 21 22	23 24 25 26	27 28 29	30 31 32 33 34	35 36 37 38 39	40 41 42 43 44	45 46 47 48 49	50 51 52 53 54	55 56 57 58	59 60 61 62	63 64 65 66	67 68 69 70	71 72 73 74 75	76 77 78 79 80
CONTROL NUMBER	DATE	CARD NO.	CREW SIZE	HRLY RATE	WORK DAY	LENGTH OF ROUTE	AREA SERVED	GROSS WEIGHT			DIST. TO ROUTE	TIME TO. ROUTE	DIST. DRIVEN COLLECT	TIME COLLECT	CONS. COST TODAY	
								LOAD 1	LOAD 2	LOAD 3						

CARD NO. 2

1	2	3	4	5	6	7	8	9	10	11	12	
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19	20 21 22 23	24 25 26 27	28 29 30 31	32 33 34	35 36 37	38 39 40	41 42 43	44 45 46 47 48	49 50 51 52 53	54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
CONTROL NUMBER	DATE	CARD NO.	DIST. XPORTING			TIME XPORTING			ECON LEVEL	NO. OF RESIDENCE SERVED	NO. OF PEOPLE SERVED	
			LOAD 1	LOAD 2	LOAD 3	LOAD 1	LOAD 2	LOAD 3				

CARD NO. 3

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16	17 18 19	20 21 22	23 24 25	26 27 28	29 30 31 32 33 34 35 36 37	38 39 40 41 42 43 44 45 46	47 48 49 50 51	52 53 54 55	56 57 58 59	60 61 62 63	64 65 66 67	68 69 70 71 72 73	74 75 76 77 78 79 80
CONTROL NUMBER	DATE	CARD NO.	TYPE VEH.	SIZE VEH.	AGE VEH.	VEHICLE LIFE EXPECTANCY IN OP. HOURS	COST OF VEHICLE IN DOLLARS	MAINT COST/ OP. MIN.	TYPE SERV.	DISP. POINT	COLLECT. SCHED.	SEP.	VEHICLE WT. (TARE)	

FIGURE 4

The main limitation of the program's capability is its capacity to process maximum of 31 days of data for each of the 14 routes. However, the program was written that an indicator set could be placed at the end of each period up to 31 days. The computer would then assimilate and process the data, using the progr shown in Appendix J for the first period. Upon completion of the computation for the first period, the computer program will cause the information to be printed out. It will then proceed to the next data set, perform the computations, and cause the data to be printed. Cycles of this sort will continue until all of the data deck is read and the computer encounters a card that indicates the end of th data deck, whereupon the operation is terminated.

The control number is a 10-digit number that occurs as the first item in each of the six reports. It is comprised of four major elements. One element, a two-digit number, indicates the EPA region in which the route operates. The next two digits identify the SMSA in which the route operates; the next three digits indica the political jurisdiction (city or county) in which the route operates. The next three digits indicate the route within the given political jurisdiction. The index of cities and routes will be kept by BSWM and the regional representatives. By reviewing the number, anyone can identify the EPA region and the SMSA in which the route operates by the first three digits. In order to obtain further identification, contact must be made with the BSWM regional representative for the region affected. The control number also furnishes a means of following one syste through all of the reports.

The vehicle and crew report contains information on parameters affecting vehicle capital and operating costs and on items related to the crew costs. These items are defined in Table 6. The detailed route report contains information on parameters identifying route characteristics. These items are defined in Table 7.

TABLE 6

VEHICLE AND CREW DETAILED REPORT DEFINITIONS

Heading	Definition
Type	Type vehicle used; i.e., front loader, side loader, rear loader, or train.
Size	Vehicle capacity to hold waste, expressed in cubic yards.
Age	Age of the vehicle used on the route, expressed in years.
Life expectancy	Number of years that an organization plans to use a vehicle before selling it, expressed in years.
Cost	Cost of the packer and the vehicle, expressed in dollars.
Maintenance cost per operating hour	Costs of any repairs made to the vehicle normalized to an operating hour, expressed in dollars, cents, and tenths of cents.
Consumable cost per operating hour	Cost of gasoline or other fuel and crank case oil normalized to an operating hour, expressed in dollars, cents, and tenths of cents.
Size (under crew characteristics)	Number of workers, including the vehicle driver, and a specific collection crew.
Hourly rate	Rate of pay for that specific crew, expressed in dollars and cents.
Work hours per week	Number of hours of work for which that crew is paid each week.

TABLE 7

ROUTE DETAILED REPORT DEFINITIONS

Heading	Definition
Length per day	Average number of miles of streets or alleys covered by the vehicle and crew each day for the period selected.
Type served	Place where the crew picks up the household waste.
Discharge point	Place where the collection vehicle discharges the household waste that it has collected.
Schedule	Number of times each household's waste is collected in a week.
Area served	Number of square miles served by the crew and vehicle each week.
Separation required	Indicates whether the food waste must be separated from the remainder of the waste.
Average weight per day	Average number of pounds of waste collected by the vehicle and crew each day.

The operations report contains the average time, distance, and solid waste quantity encountered for each route so that differences in these vital measurements can be ascertained. These items are defined in Table 8. The cost breakdown report shows the manpower and equipment cost for each identifiable task associated with collection. This report also contains a measurement of the incentive given to collection crew members. It is expressed as a ratio of the time actually worked to the time for which the crew was paid. These items are defined in Table 9. The population characteristics report shows the economic level of the neighborhood covered by the route, along with the number of residences and number of people served. These items are defined in Table 10. The sixth report, a summary report, compares nine of the items that are most readily identifiable.

Descriptions of the routes from which the data was taken are included as Appendix F. Descriptions of the SMSA's in which the routes operate are included as Appendix G.

TABLE 8

OPERATIONS DETAILED REPORT DEFINITIONS

Heading	Definition
Pool to start of route distance	Average distance that the vehicle and crew travel from the place where the vehicle is started to the beginning of the route.
Pool to start of route time	Average time required to travel from the point of vehicle storage to the beginning of the route.
Collection distance	Average number of miles driven collecting waste.
Collection time	Average time in minutes spent collecting waste.
Transportation distance	Average number of miles that the vehicle travels to and from the discharge point, including the final trip from discharge point to motor pool.
Transportation time	Average number of minutes that the vehicle spent traveling to and from the discharge point including the last trip from discharge point to motor pool.
Time to collect per residence served	Average time required to collect from each separate house on the route for this period.
Quantity generated per residence per day	Average number of pounds of waste collected from each residence per day for the period of the report.
Quantity generated per person per day	Average number of pounds of waste per person per day collected from the route for the period of the report.

TABLE 9

COST BREAKDOWN DETAILED REPORT DEFINITIONS

Heading	Definition
Cost to travel to route per day	Cost of vehicle per operating minute + cost of crew per minute + maintenance cost per operating minute + consumable cost per operating minute x average time from pool to start of route.
Equipment cost to collect per day	Cost of vehicle per operating minute + maintenance cost per operating minute + consumable cost per operating minute x average minutes driven collecting per day.
Manpower cost to collect per day	Average crew wages per minute x average minutes spent collecting per day.
Total cost to collect per day	Equipment cost to collect per day + manpower cos to collect per day.
Equipment cost to transport per day	Average cost of vehicle per operating minute + maintenance cost per operating minute + consumable cost per operating minute x average minutes spent transporting per day.
Manpower cost to transport per day	Average crew wages per minute x average minutes spent transporting per day.
Total cost to transport per day	Equipment cost to transport per day + manpower cost to transport per day.
Ratio of productive to paid time	Average manpower cost to travel to route, collect, and transport per day divided by average wage paid to personnel per day.
Cost per day	Sum of the average equipment cost, including maintenance and consumables + average crew cost per day.
Cost per square mile per week	Average cost of servicing 1 square mile of the city, using their crew and vehicle.

TABLE 10

POPULATION CHARACTERISTICS REPORT DEFINITIONS

Heading	Definition
Economic level	Apparent average wealth of the persons living in the neighborhood based on estimated value of housing. The scale extends from 1 through 10 inclusive, number 1 being the most destitute number and 10 being the most wealthy.
Residences served	Total number of separate residences served on the route. If a residence was served more than once a week, it was counted as one residence.
People served	Total number of different people served. If a person was served more than once a week, it was counted as only one person.

Implementation of Pilot System

Since the major problems in handling and disposing of solid wastes are found in urban areas, it was decided to concentrate the initial data collection effort in three SMSA's. The SMSA's utilized as data sources for development of the Data Acquisition and Analysis System were Cleveland, Ohio; Wichita Falls, Texas; and Orlando, Florida. These SMSA's were selected because they represent a wide range of climates; economic, social, and cultural patterns; population magnitudes, densities, and trends; and sophistication of municipal solid waste management information systems.

In these SMSA's, ten different system managers (e.g., public works directors, private collectors, etc.) were contacted. Operators in Cleveland, Ohio, were not gathering any data for their own use; in Orlando, Florida, operators had only recently begun to collect data; and Wichita Falls, Texas, operating under a grant from the BSWM, had one of the most sophisticated data systems in operation anywhere. Cleveland is representative of a large northeastern industrial city with a shifting population. Wichita Falls represents a typical southwest farming community with a stable population. Orlando represents a southern community with the most rapidly expanding population in the United States. The selection of these three SMSA's assured that the pilot system would sample a wide spectrum of operating data system, geography, size, and growth characteristics.

Although a SMSA is a convenient way for evaluating the services rendered to large portions of the population, there is no specific agency of person who can act for an entire SMSA. To obtain the required information, it was necessary to work with the various local governments within their individual jurdisdictions. To have meaningful information, participating local governments were selected to represent the SMSA. Within each local government's operation, individual routes were selected to represent the local area. The Data Acquisition and Analysis System was so structured that the actual measurements would be made on residential collection routes. The composite information from these routes would give a good indication of the local community. The composite of the local communities would represent the SMSA, and the composite of SMSA's would represent the region. The composite of the regions would depict the national picture. The local jurisdictions selected included both city and county governments.

Route Selection

In the pilot program, the number of SMSA's and the number of routes in each SMSA were kept to a minimum for reasons of economy and control of data. The contract with BSWM dictated that both municipally operated and privately operated systems be investigated; it also specified the distribution of sample areas between the major population center and the rest of the SMSA. This restriction and the number of possible factors involved made it impossible to investigate all of the combinations hypothesized to effect the collection of household solid waste. Therefore, it was decided to concentrate on housing density and economic level as being the major influences.

ROUTE SELECTIONS

POPULATION DENSITY	CLEVELAND			WICHITA FALLS			ORLANDO		
	INCOME LEVEL			INCOME LEVEL			INCOME LEVEL		
	LO	MED	HI	LO	MED	HI	LO	MED	HI
LO	X					X		X	
MED		X		X	ⓧ			ⓧ	X
HI	ⓧ		X		X		X		

X = ROUTES SELECTED AS PART OF CONTROLLED EXPERIMENT.

ⓧ = ADDITIONAL ROUTES – MAY BE VARIED AS REQUIRED.

FIGURE 5

Both factors were divided into low, medium, and high categories. The economic levels assigned were value judgments based on the age and appearance of housing in the area. Preliminary investigations were made of tax records to verify that more specific methods of determining value were available, and that the value judgments did, to some degree, reflect actual values. In turn, housing costs could be justified as an indicator of economic status of an area because of the checks and balances in the housing market (i.e., real estate dealers encourage people to buy the most expensive property they can afford, while mortgaging agencies keep the buyer from overextending himself). On most routes, the operators already had an accurate count of the number of houses served. When this was not the case, an actual count was made. Census tract data was used to compute population density from housing density.

A matrix showing the nine combinations of route economic level and population density is shown in Figure 5. From this matrix, three factor combinations were selected at random for each SMSA with the restriction that every level of income be represented. The fourth route factor combination was selected later on the basis of convenience.

Contact was made with the operators of solid waste collection systems for which routes were to be selected. The operators suggested routes that matched the economic level, population density, and route homogeniety requirements. The candidate routes were inspected, and a final selection was made. The routes and the SMSA's are described in Appendixes F and G, respectively.

Once the routes were selected, the contractor's representative met with the route driver and/or supervisor to explain the data gathering method. This explanation included the data elements to be obtained, the procedure for entering them on the forms, and the reporting frequency. Having thus instructed the data gatherer, a supply of forms and self-addressed envelopes were left with the individual responsible. The contractor's representative next toured the route, either in the collection vehicle or immediately behind the vehicle, noting and recording the time the vehicle left the motor pool, the distance and time required to travel to the first pickup, the distance driven while collecting, the time the vehicle left the route for the discharge point, and the time and mileage upon return to the route. This information was recorded on the form shown in Figure 3 for each cycle of collection. It was later used as a reference against which the data submitted by the collection vehicle driver was validated. The knowledge gained in establishing this reference proved invaluable later in the program. It allowed the analyst to recognize changes in the route and errors made in recording the information required.

The "constant" information collected on the form in Figure 2 was for the most part readily available from the route supervisor and/or the system managers. However, there were several data elements that were more difficult to obtain such as the land area required for the motor pool, the vehicle maintenance cost, the area served, the economic level, and the various distances. All of these data elements, except maintenance cost and motor pool area, could be measured or derived by the contractor's representative. In cases where the maintenance cost was not available, the motor vehicle organization would either furnish budgetary information or maintenance records from which the data could be developed. The area used for the motor pool was estimated by pacing the distances. Once this form was completed, periodic liaison was maintained to record any changes that might have occurred. While these elements were difficult to obtain, they could be obtained. In summary, all of the data required was obtained from all of the sources solicited.

DISPOSAL FACILITIES

As mentioned earlier, the primary data collection effort was directed toward the residential solid waste collection activity. However, in accordance with the contract requirements, an attempt was made to establish the feasibility of collecting uniform, continuous, and reliable data for solid waste treatment and disposal. Data was collected from one disposal and/or treatment facility in each SMSA. Information was obtained on the following facilities: incinerator, Cleveland SMSA; landfill, Wichita Falls SMSA; and incinerator, Orlando SMSA.

The information concerning each disposal facility and/or site was obtained from responsible officials and from records or reports. This information was then organized in a systematic manner to obtain, as nearly as possible, the effective cost of disposing of a load or ton of solid waste, The cost per operating day was also determined. Where no cost data was available, costs were assumed or constructed. As more experience is gained in obtaining information on disposal facilities and as better information becomes available, the initial efforts reflected in this report should be revised and improved.

Incinerator - Cleveland SMSA

In the Cleveland SMSA, the solid waste processing facility was an incinerator. In 1970, the incinerator handled 73,690 tons (weighed) of solid waste. Incinerator residue and fly ash is disposed of in a landfill on the premises. A summary of the physical characteristics of this incinerator was provided by the incinerator superintendent and is presented in Appendix H.

Capital and operating costs for the Cleveland incinerator are presented in Table 11. The financial information was extracted from the incinerator plant annual report for 1970, augmented by a list of capital expenditures provided by the Department of Public Service. Construction costs for the plant were $2,300,000 in 1960. Additional capital expenditures made since that time are as follows:

1961	$47,732.00
1966	14,754.00
1967	43,510.00
1968	98,440.00
1971 under contract	318,675.00

Operating costs for the incinerator in 1970 were $10.35/ton while the owning and operating costs totalled $2,900 per day of operation.

TABLE 11

COST DATA FOR INCINERATOR IN CLEVELAND SMSA

Cost Items	Years 1968	1969	1970
Labor	$444,971	$525,039	$580,153
Power	32,617[1]	32,617[1]	32,617
Gas	5,684[1]	5,684[1]	5,684
Hauling residue	4,500[1]	4,500[1]	4,500
Miscellaneous (includes maintenance)	16,400[1]	20,975	14,589
Depreciation	120,300[2]	125,222[2]	125,222[2]
Total Costs[3]	$624,472	$714,037	$762,765
Number of loads	27,329	29,350	29,182
Cost per load	$ 22.85	$ 24.33	$ 26.14
Number of tons	74,032	76,106	73,690
Cost per ton	$ 8.44	$ 9.38	$ 10.35
Operating days	287	259	263
Cost per operating day	$2175.86	$2756.90	$2900.25

[1] Assumed or constructed costs to permit yearly comparisons.

[2] Depreciation was calculated, using the straight-line method. No relative cost breakdown between operating equipment and building was available. Although the building has a relatively long useful life (30 to 40 years for depreciation purposes) and the operating equipment has a relatively short useful life (10 years for depreciation purposes), a useful life of 20 years was assumed for the whole incinerator. Capital expenditures through 1968 were including in figuring depreciation.

[3] Charges for sick leave in the amounts of $10,837 for 1968, $9,151 for 1969, and $11,310 for 1970 were not included in the total costs. Costs of personnel fringe benefits were unknown. These costs should also be included in the total costs.

Landfill - Wichita Falls SMSA

In the Wichita Falls SMSA, one city (population 8,000) owns a landfill just outside the city limits. This landfill is operated by a private contractor, who also collects all residential solid waste within the city. The landfill occupies an area of five acres, whose estimated value is $250.00 per acre. The site has been in operation 11 years. The remaining life expected is from 3 to 4 years. The facility is operated 7 hours daily on Monday, Tuesday, Thursday, and Friday. Solid waste is covered on a daily basis, using a front end loader which is 2 years old and which cost $21,800.

Cost data pertaining to the operation of this landfill is summarized in Table 12. Owning and operating costs were estimated at $2.39/ton based on solid waste receipts of 21.6 tons/operating day. Cost figures were obtained from the private contractor.

TABLE 12

COST DATA FOR LANDFILL IN WICHITA FALLS SMSA

Cost Items	Costs per operating day
Labor	$20.00
Operating costs (consumables)	3.56
Maintenance	2.94
Depreciation (5 years)	20.20
Overhead	5.00 (estimated)
Total daily costs	$51.70
Average loads per day	6.5
Cost per load	7.95
Tons per day	21.6 (estimated from weight data of route 011)
Cost per ton	$ 2.39

Incinerator - Orlando SMSA

This incinerator is located on a prison farm. Construction was started in 1941 and was completed and in operation in March, 1943. There are two furnaces with a designed capacity of 150 tons per day each. The actual capacity as operating today is 80 to 90 tons per day.

The original investment costs are unknown. The incinerator is considered to be fully depreciated. The current operating budget for 1971 is $84,000. An additional $23,000 has been allocated this year for relining the furnaces. Relining is accomplished every 5 to 6 years. The operating budget of $84,000 includes all costs incidental to operating the incinerator. Of this amount, $50,000 is for personnel costs and $20,000 is for natural gas to operate two antipollution afterburners that were installed in December 1970.

The antipollution afterburners became operational in January 1971. These burners generate 19,000,000 BTU per hour. The cost of this equipment, including installation, was $35,000. The incinerator operates two 10-hour shifts daily on Monday through Friday. Eight individuals, five of whom are unpaid prison laborers, operate on each shift. The three paid crewmen include a foreman, a crane operator, and a truck-driver.

The plant is shut down on weekends. Every other Sunday, the furnaces are cleaned and maintained as required.

Only garbage is processed through the incinerator. This is not weighed, but on the basis of previous weighing studies, it is estimated that each load averages a little more than 5 tons. The average number of loads received by day is as follows:

Monday - 30
Tuesday - 29
Wednesday - 26
Thursday - 34
Friday - 35

On Saturday, between 8 and 13 loads are dumped in the pit; on Sunday, between 4 and 7 loads are dumped in the pit. On a yearly basis, the loads processed per week average between 173 and 174.

Assuming a fully depreciated plant, 170 loads per week, and an annual operating budget of $84,000, the cost per load is $9.50. At 5 tons per load, the cost per ton is $1.90.

Summary of Facility Study

It is apparent that the pilot data system could be designed to accommodate the collection and processing of data related to solid waste qualities, handling costs, equipment utilization, and manpower requirements of processing and disposal facilities. However, during the pilot study, data was not collected on a regular basis from such facilities and much more effort needs to be concentrated upon this activity.

CHARACTERIZATION STUDIES

Waste characterization was accomplished in accordance with contract requirements by manual separation into 11 categories. Waste was collected from five households on each route once per 3-month period of the contract by a special crew and was transported to a remote site, where it was separated and weighed. The results are shown in Appendix I. During the second quarter, portions of the characterization samples were returned to Cincinnati for bacterial analysis. Care was taken to maintain the integrity of household samples.

Selection of Data Sources

Attempts were usually made to randomly select the houses from which waste samples were taken. However, in several cases they were arbitarily chosen. The random selection was accomplished by obtaining the address of each house on the route that was to be sampled. The addresses were determined by either actual observation (traveling the route and recording the number and street name of each residence) or by obtaining the address from some existing record, such as the city water-meter records. Once the addresses were determined, a number was assigned to each address. These numbers were recorded on individual slips of paper and placed in a bowl. Ten numbers were withdrawn. The first five were used as the primary selection. The next five were alternates in case one or more primary selections were vacant houses, had no solid waste on collection day, or for some other reason were unacceptable. Nonrandom selection was accomplished by choosing evenly spaced block faces from a map and then arbitrarily selecting houses from those block faces on collection day. An attempt was made to pick up the waste for the second quarter's characterization from the same houses that were sampled for the first characterization. If the houses were unoccupied or if no waste existed, alternates were arbitrarily chosen.

Random selection offers the best opportunity for an unbiased sample, while the arbitrary selection is the most economical process.

Characterization Procedure

In collecting the household samples, a panel truck manned by a crew consisting of a driver and two laborers was dispatched to the various locations to make the collection. At each selected household, all solid waste set out for collection was transferred from the resident's containers into large plastic bags (3 mil thickness, 55 gallon capacity) or other suitable containers. Each sample was labeled to identify the date and address of origin.

Timing of sample collection was critical. The special vehicle and crew had to arrive after the housewife deposited the waste from the house in the receptacle, from which the study team picked it up before the regular collection vehicle arrived. This was important if the sample was to be truly representative of the waste from that household. It was found, during this phase of the study, that in many cases the arrival of any type of collection vehicle triggered the addition of considerable waste to that already standing.

The samples were hauled to a remote location (such as a city garage) for manual separation into the following 12 categories: food waste; paper; garden wastes; plastics; rubber and leather; textiles; wood; metals; glass and ceramics; rock, dirt and ash; and fines (all material passing a 1-inch seive). Each category of waste was placed in one of 12 containers. As each container was filled, its gross weight was recorded (the scales were zeroed and the tare weights of the containers were obtained prior to separation). Net weights and percentages of waste categories were then computed for each sample. The samples averaged about 30 pounds per household. With a three-man crew, the actual separation or characterization of the waste required about 30 minutes per household (i.e. 90 man-minutes).

Special Equipment and Facilities

Several types of scales were used. The type most commonly used was able to measure to the nearest ounce; one had a capacity of 300 pounds, and another had a capacity of 50 pounds. One scale measured to the nearest tenth of a pound, and still another to the nearest quarter pound. All except one were beam scales; the other was a spring scale. All were satisfactory except the spring scale, and it was unsatisfactory because it was not sufficiently accurate (quarter-pound accuracy). The scales calibrated in tenths of a pound were the most satisfactory.

Laborers in Cleveland and Orlando were obtained from private employment agencies. When part-time help is obtained from these agencies, workers must be guaranteed 4 hours work/day. Since similar organizations were not available in the Wichita Falls SMSA, the solid waste management agencies participating in the pilot study were asked to suggest sources of temporary help. Two self-employed laborers were eventually located.

Facilities for the separation studies were also obtained from the cities involved in the data collection effort. In both Orlando and Cleveland, space was obtained at the incinerator facility. In the Wichita Falls SMSA, the first characterization was made in rented garages, but by the time of the second characterization, the private collection contractor had moved to a larger, completely enclosed garage and motor pool which was used for separation. Items such as dry ice, packing materials, scales, etc., were purchased or rented locally.

DEAL WITH COMMUNITIES

One piece of information sought through the pilot program was the cost incurred by the system operator in gathering data for the Data Acquisition and Analysis System. The contract specifically stated that the contractor would deal with the communities and/or solid waste system operators in negotiating remibursement for the costs incurred.

In general, operators felt they incurred extra costs in taking their vehicles to weighing stations, waiting at the weighing station, paying for use of scales, and handling data sheets. However, the operators also indicated that if the system could produce usable information and if they had access to use of the system, this alone was a worthwhile reason for participating.

Reimbursement costs varied over a wide range. However, in all cases except for Wichita Falls, the costs associated with obtaining vehicle weights represented from 44 to 100 percent of the total reimbursable costs incurred. Remaining costs were attributable to the driver's time in furnishing daily data and to supervisory time for handling the forms. Major variations were caused by two factors: the availability of truck weighing facilities and the number of truck loads of waste for which data was gathered.

For example, Cleveland operates approximately 190 collection routes. The routes discharge to an incinerator that is owned and operated by the City, or to a privately owned and operated landfill. Since scales were available at the incinerator, it was possible for Cleveland to send the vehicle from the selected routes to the incinerator at no extra cost. On the other hand, Orlando operates approximately 28 collection routes. The trucks hauling residential waste discharge at an incinerator where no scales are available, and the trucks hauling yard waste discharge at a landfill where no scales are available. Therefore, the vehicles being studied had to be directed to the nearest public scales enroute to the discharge point. The scale operator had other duties and the truck and crew usually encountered a delay of approximately 15 minutes for each weighing. In this particular system (Orlando), the work week was a scheduled 50 hours and the accelerated route completion incentive small; therefore, it was necessary to pay the employees for the additional time they were required to spend going to and waiting at the scales.

A second factor that increased the costs was the number of loads hauled. In Orlando, for example, the two trucks of interest were collecting and hauling approximately 20 loads per week. Thus the costs incurred were for time at the weighing scales and the use of the scales, which amounted to a total of approximately 20 man-hours per week plus $30 for the use of the scales.

The smaller communities, which operated one or two trucks and hauled only one or, at most, two loads a day, incurred the same kinds of costs as those described for the Orlando system. In addition, they incurred and passed on a charge for handling and mailing the completed data forms.

The entire cost at Maitland, Florida, was for rental scales to weigh loaded vehicles. Wichita Falls proved to be an exceptional case since the city already collected the data required for the pilot Data Acquisition and Analysis System. Thus, Wichita Falls made available copies of the computer-produced reports that were being produced under a demonstration grant from BSWM. The only costs incurred were for additional copies of the data and for handling and mailing.

RESULTS

General

The Pilot Data Acquisition and Analysis System successfully developed techniques for obtaining and processing solid waste information from a variety of cities across the United States. It successfully implemented a collection routine which provided accurate data from three SMSA's for a 6-month period and automatically processed the data into meaningful results. The results were shown to and discussed with various possible users at federal, local, and private sector levels. Two organizations made immediate use of this data to effect adjustments to their existing operation. While the pilot system operation was of such short duration that correlations and trends were not established, enough analysis was accomplished to prove that the data can be so applied. By virtue of the above facts, the Pilot Data Acquisition and Analysis System did show that it is feasible to establish a system on a national basis which will gather data and process it into meaningful results and that it can be used by solid waste managers, planners, and operators ranging from federal to local levels.

Developing a Concept

A result of the Pilot Data Acquisition and Analysis System was the development of a concept for implementing that system, on a national basis, into the national data network. This concept for implementation is much broader in scope than that verified during the pilot program; however, the pilot program was comprehensive enough to determine the total feasibility of applying the techniques on a national basis. This is substantiated by the fact that though the program was limited to residential solid waste, information was obtained from every source solicited and in all cases this information was processed into meaningful results.

Data Processing and Collection System

Results of the pilot system were that usable data was collected from 100% of all routes within each SMSA from which it was attempted to be obtained. A major problem of critical importance to the successful operation of the data system was identified during data collection. That problem is maintaining the raw data to the same data base. Because of the wide variation in the existing solid waste collection operation and because the basic information was being provided by individuals not skilled in data-gathering operations, extreme difficulty was encountered in maintaining an accurate and valid data base. To solve this problem, it was necessary to maintain individuals within the data system operation that were familiar with each of the routes being sampled. This individual would review each data sheet received to assure its validity. Because of his knowledge of each operation, he could identify discrepancies and immediately correct such by telephone. Equally important in maintaining accurate and valid data was maintaining personal contact with individuals who were supplying the data. It was determined during the pilot program that the accuracy and timeliness of the data were directly proportional to the rapport established between the data system operator and the data provider. The resolution of this problem was a visit to each route being sampled in each SMSA once per quarter by the data system representative.

The data processing system developed during the pilot program is compatible with the IBM 360 and 370 series computers and is in Fortran Four language. The processing system successfully and economically processed the data collected during the program into meaningful results. This program was limited to processing collection data from residential routes and is designed to work with other program modules to be developed at a later date. By successfully processing data which varied in both quantity and source of origin, this processing system proved its capability to handle the processing for the national network.

Sampling Disposal or Treatment Facilities

Data was collected from at least one disposal facility in each SMSA. The technique used in collecting these data was to obtain the records normally maintained by each facility. Because of the low volume of this data, it was manually processed and meaningful results were obtained; however, these results were not to the same level of detail as were the processed results of the collection operation. In order to achieve the same level of results, it will be necessary to develop specific disposal forms and implement these in the monitored facilities. The fact that the operators of these facilities were willing to cooperate and provide information into the data system proves the feasibility of collecting this data.

Characterization

A new method for characterizing solid waste was successfully developed on this program. The technique developed was to collect solid waste samples from selected households on each route just prior to normal pickup by the collection vehicle. The solid waste was then hand separated into the required categories and weighed. Percentage of each composition by weight was then determined. This technique proved feasible and economical and can be used on a large national basis.

Dealing with Communities

The overall result of dealing with communities was considered outstanding. In all cases, it was possible to establish a reasonable working relationship with the principals within the municipalities and private collectors. The relationship with each participant varied slightly, based on their specific situation, but in all cases they expected something from the system in return for providing data to the system. This return from the system would either be information or reasonable financial support for the effort required from them or both. In all cases, the best relationship and results were from those with whom the closest relation was established. There was a noticeable deterioration in relationship if timely followup of commitments was not accomplished. The best technique developed for the establishment of good relations was for an initial visit to be accomplished jointly by a BSWM representative and the contractor, closely followed by the implementation of the program. The fact that a reasonable relationship was established with widely varying political and private entities proved feasibility of doing the same on a national basis.

CONCEPT FOR IMPLEMENTATION OF THE NATIONAL DATA NETWORK

General Concept

In the development of the National Data Network, the dominant influence must be the information that is provided from this network to the users. The primary purpose for such a network must be to provide accurate information in a usable form to all users. In the case of this National Data Network, its users range from top federal managers to local planners and operators. This means that the national network must be responsive to the informational needs of this full range of people. To meet this requirement, the system must be designed to provide a broad spectrum of accurate information; therefore, it is envisioned that the information from this system would be provided in three different output categories. The first or top level would be a small volume report which summarizes the information on a gross basis such as national and/or regional. This report would provide data needed to high level officials who are interested in an overview of the problem. The second report would be a detailed report which would provide processed information on a regional, SMSA, and route level summarized on a monthly basis. This would provide local planners the basic information needed for planning purposes. The third type report would be a special request report. This report would be provided to planners and operators at their request and would provide specialized information about route and operational characteristics. This information would assist operators and planners in refining their specific systems and/or resolve specific problems within their operations.

In order to provide this type informational system, a data processing system must be designed and developed which would take data that has been collected from various routes across the United States and sum this information from routes to SMSA's, from SMSA's to regions, and from regions into a national picture. This data processing system must be flexible enough to allow access to detailed information at any level.

In order to handle the magnitude of data, to timely process that data, and to access the data to the desired level, this processing system must be computerized. Such a system can best be handled on a interrelated modular basis so that the various types of information can be inputted into separate modules which will process the data and interrelate the necessary areas. Specifically, there should be a residential collection module, a commercial collection module, a transportation (i.e., transfer station) module, and a disposal module. These modules should be capable of operating independently and of providing a breakdown of data about any of their specific areas or to be operated interrelated to provide the capability of the activities, the cost involved, and the total processing of solid waste. The pilot program has developed the residential collection module of this system. The other modules should be developed and the total mechanized program refined as the National Data Network is expanded to include commercial, transporation, and additional disposal data.

The pilot program data base must be expanded to include additional samples in order to portray a statistically valid picture of the United States. The actual sample size should be determined as the system is expanded. Based on present information, it appears that five or ten routes distributed over an SMSA would provide a statistically valid picture of the SMSA, three to five SMSA's would establish a statistically valid picture of a region, and the ten regions would then establish a statistically valid picture of the nation.

A continuous monitor (daily) is required on the selected routes and facilities in order to establish a sound data base. After this sound base has been established, it may be possible to reduce the number of samples and/or to gather data on an intermittent basis and still maintain the valid base.

This data system should be expanded as rapidly as available funds will allow because the full usefulness of the system will not be realized until the total system has been in operation for an extended period of time.

The following sections provide a detailed concept for expanding the present pilot system into the national system.

Data Collection

The data collection technique utilized in the pilot program proved very effective and this basic technique should be employed in data gathering for the entire National Data Network. The technique for data collection for residential solid waste should be the same as that utilized during the pilot program.

The disposal data collected during the pilot program provided meaningful information but was not adequate for the total system. Specific data sheets which provide more detailed information on disposal activities should be developed and implemented in each of the monitored disposal facilities. Data sheets should also be developed for the commercial solid waste and the transportation phase. All of these data sheets should be patterned after the concept used in developing the data during the pilot program; that is, to contain the minimum data elements in order to produce the required output. They should also be designed so that there is minimum impact on any operation that is providing data. To achieve this, only information that changes on a daily basis should be provided by the operators. Periodic data should be gathered and maintained by the data system personnel.

To assure a common base for data and the validity of the collected data, the operators of the data system must maintain first-hand detailed knowledge of all routes within the data system and a personal relationship with individuals providing the data. This can best be accomplished by the operators of the data system periodically visiting each route. A review of each route and the reestablishment of personal contact with the operators on a quarterly basis proved to be effective and is the recommended cycle.

In order to continually verify the validity of the data, it is necessary for the individual who is familiar with the route to review each data sheet when it is received. If problems are identified, immediate telephone contact can be established with the individual who completed the form and the situation remedied.

In order to achieve and maintain a valid data base, maximum continuity in the system must be maintained; that is, the same personnel from the data system operations should continue to deal with the same data contributors.

Characterization

The technique developed and implemented for characterization during the pilot program was effective and should be utilized in the national system. This technique of collecting solid waste samples from selected households prior to the collection by the compactor vehicle allows for ease of separation and identification. It also provides additional information that will be valuable on a large sample basis such as the actual weight from a given house on a given day. This will assist in establishing generation per capita and seasonal variations.

Solid waste samples should be collected and characterized on a quarterly basis. By accomplishing it on this basis, seasonal and geographical fluctuations can be identified. The quarterly period also coincides with the personnel contact cycle; therefore, it permits the data operations personnel to accomplish characterization and data verification at the same time.

Data Processing

The data processing system is an important part of the National Data Network and should be expanded as the data system itself is expanded. The pilot program data processing development was restricted to that necessary for the processing of residential collection data. This is a complete module for residential collection and should continue to be used for the processing of that data.

The disposal data collected during the pilot program was not of the magnitude that required computer processing; therefore, it was manually processed. It is anticipated that this data will be greatly expanded and will require an automated data processing system. A processing module for disposal data should be developed in the early phases of the implementation program.

Data processing modules for commercial and transportation data should be developed which are similar to and compatible with the residential and disposal modules.

As the processing system is developed on a step-by-step basis into the total processing system, computergraphics and terminal querying capabilities should be considered. Computergraphics would allow the automated printout of much of the desired information, and querying would allow the rapid production of special reports. However, it must be emphasized that expansion into these two areas should be highly controlled in order to prevent a system which is over exotic and produces little meaningful results.

Implementation Schedule

The rapid implementation of this National Data Network is important from the standpoint that maximum utilization of the results will only be achieved when the system is fully operational and has been so for a period of time. However, in the expansion of the system, it is extremely important to maintain a balance between the obtaining of additional data and the ability of the system to validate and process the data. Of most importance at all times must be the authenticity and validity of the data within that system!

The system implemented during the pilot phase should provide the base from which the national system is developed. The data collected from the Cleveland, Wichita Falls, and Orlando SMSA's should be continued as it is for the collection and processing of residential data. The system should be immediately expanded to include more detailed data from the disposal area. This should include the development and the immediate implementation of specific forms with respect to disposal.

This residential and disposal data system (including characterization) should be expanded into new SMSA's at the rate of one per month. This rate allows an orderly and timely expansion of the system and a reasonable buildup of data. If desired, the system can be expanded two or three times this rapidly; however, it is felt that this rapid expansion may cause some problems in maintaining data validity. A slower impelentation rate would unnecessarily delay establishing the complete system, thus delaying the benefits of this much needed system.

Collection of commercial and transportation data should be accomplished in the same municipalities that residential and disposal data is being collected, but on a 1-year lag schedule. This 1-year lag will permit the accomplishment of a pilot program to develop the techniques that should be used in the collection of this type information. The residential pilot program proved that data could be collected from these operations on a national basis; however, it did not develop the techniques to be used in the actual collection and manipulation of commercial and transportation data. This 1-year period allows 9 months for a commercial and transportation pilot program to be accomplished and 3 additional months as a buffer before the start of expansion.

The implementation of the data system in a new SMSA should require approximately 2 weeks of operation in that SMSA. The update of that information each quarter, the reestablishing of personal contact, and the characterization of the residential solid waste will require approximately 1 week. The implementation of the commercial and transportation system should be accomplished 1 year after the initial implementation of the residential system and in conjunction with the normal quarterly visits.

The implementation rate of one per month should be maintained until the maximum number (30 to 50) of SMSA's to be monitored has been implemented. Once the total national network has been implemented, it should be operated for a period of approximately 3 years to establish a sound data base across the United States. During this time, a statistical analysis should be accomplished to determine a sampling technique of lesser magnitude that will statistically maintain the accurate base.

National Data Network Cost

The cost of implementing and operating the residential and disposal portion of the National Data Network can best be determined by defining specific parameters and summing these parameters into the total system. Cost of the commercial and transportation pilot program is included but the implementation and operational cost of the program st be determined as a result of that effort. Certain efficiencies will be realized when the two programs are combined in operation. The cost of each of the parameters described below is based on experience of the pilot program of the three SMSA's. The cost, except labor, is burdened with a 0.16 general and administration factor and a .1 profit factor. Labor is based on $40,000 per man-year. All costs listed are based on the 1970 dollar value. These values should be considered as a guideline only, not as absolute values. The following costs are an average of what is projected for the system:

Reimbursing the participants. These costs include the reimbursement for time spent in filling out and verifying the operator forms, in obtaining weight with scales that are not normally available, in additional crew time involved in gaining these weights, in administrative time involved in assembling and sending out the data sheets, etc.

$1275 per SMSA per quarter

Characterization. The expenses involved directly in the characterization of solid waste, including the rental of the special vehicle for collecting the solid waste, the hiring of personnel to collect and separate the solid waste, the purchase or renting of special equipment such as scales necessary for the characterization of the solid waste and, if necessary, the renting of the space to accomplish the separation.

$ 365 per SMSA per quarter

Expendable materials. The expenses for items such as data forms, envelopes, postage for mailing the forms into the system, packing material, film, maps, gloves, plastic bags, and the necessary miscellaneous items required to accomplish the effort.

$ 385 per SMSA per quarter

Travel. Transportation to and from the SMSA's, the living expenses while operating in the SMSA's, and the rental of automobiles to support the operation.

$ 555 per SMSA per quarter
(operation)
$1825 per SMSA (implementation)

Processing system. The cost of the computer time for processing the data received and the keypunch operation necessary to put the data into the format usable by the computer.

$ 130 per SMSA per quarter

Implementation manpower. The manpower necessary for the initial establishment of the data system in an SMSA, but not for the continued operation of that system.

1 man-month ($3,333) per SMSA

Operational manpower. The manpower to operate the data system once it has been implemented in each SMSA. This includes the quarterly visitation and maintenance of the data base.

1 man-month ($3,333) per SMSA
per quarter

Refinement of disposal system. Costs to develop the forms necessary for the disposal system and to develop the computer program for processing disposal data.

3 man-months ($12,000) and
computer effort

Pilot program for commercial and transportation data acquisition and analysis system. The total effort necessary to develop the techniques that will be employed on a national basis in the National Data Network.

Included in this will be the total concept development along with the development of specific forms, the development of the computerized program to process the data, the implementation of the system in three SMSA's to verify the techniques, and the writing of a final report which will include the history of the effort as well as the concept of implementation into the national network.

$70,000 total cost

In order to project the cost of a national system, some basic assumptions must be made. These assumptions are as follows:

1. The residential pilot system will be used as a base. Expansion will be as discussed above including the expansion rate of one SMSA per month.
2. The costing included here is for the operation of the system and includes only limited special analysis and special reports beyond the normal capability of the computer program. It also includes only the computer program development for normal operations, not for computergraphics and querying.
3. The cost included in this total estimate includes the operation of the residential and disposal system, the development of the computer program for the disposal system, and the pilot program of the commercial and transportation system. It does not include the implementation and operation of the commercial and transportation system.
4. Because of the time necessary in contracting for the expansion operation, the start of the implementation is scheduled

for September and is maintained at the rate of one per month thereafter.

In order to best understand the schedule and total cost, Figures 6 and 7 and Tables 13 and 14 should be carefully examined. Figure 6 reflects the schedule for the implementation and operation of this data system. The detailed schedule shown in Figure 6 is for FY '72 only. FY '73 and FY '74 are merely a continuation of the implementation and operation pattern established in FY '72. For example, during FY '73, 12 SMSA's will be implemented into the data system and quarterly operation will occur 70 times in the followup of those 12 SMSA's plus the preceding 10 SMSA's that were implemented in FY '72 and the three that were implemented during the pilot program. In FY '74, five implementations will occur as well as 113 quarterly operations. The five SMSA's implemented in FY '74 will bring the total SMSA's within the program to 30. In the event that a larger sample is desired, the implementation during FY '74 should be continued at the rate of one per month as in the past until the total desired number is implemented. Assuming that 30 is the desired sample limit, the operation in FY '75 and the following years will be the 120 quarterly visits required to maintain the data base. The system will continue to operate at this level until it is determined by analytical methods that sampling can be reduced while still maintaining the sound data base.

Table 13 reflects the cost involved in each implementation and each quarterly operation. As stated earlier, this is the average cost involved in each of the described operations. As can be seen from the breakdown

TABLE 13

COST FOR EACH IMPLEMENTATION OR OPERATION

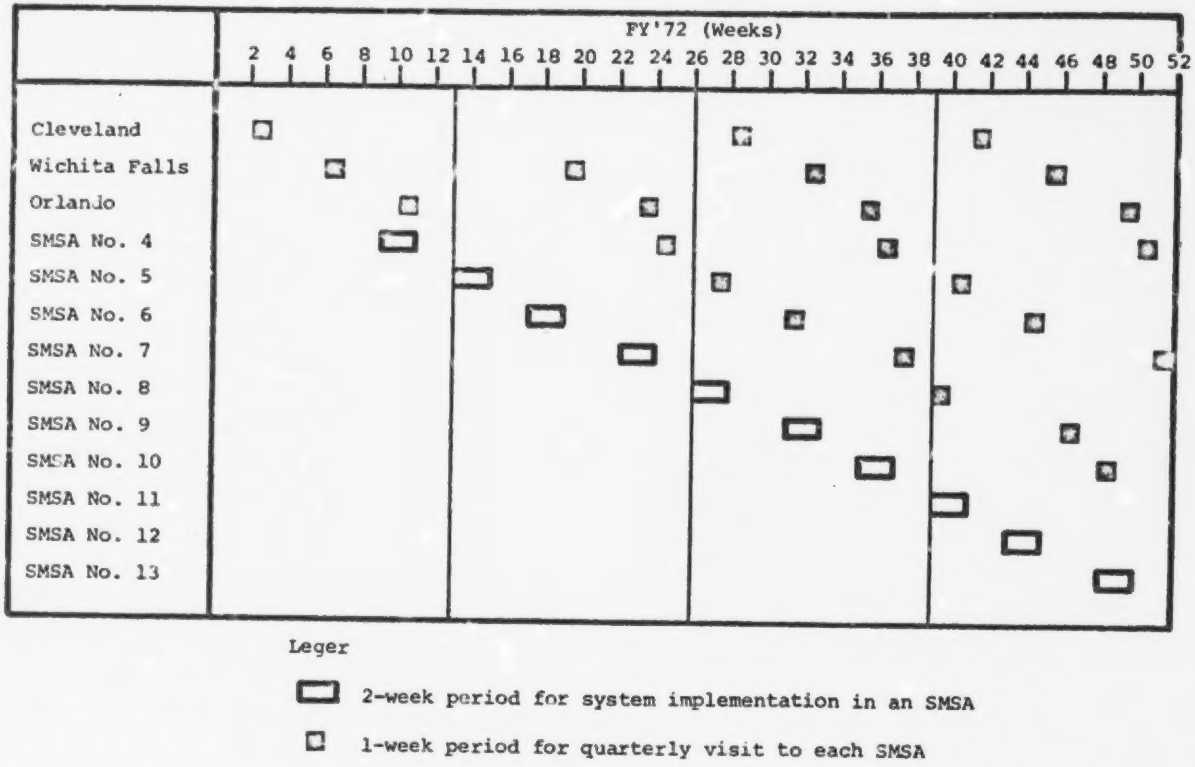
Cost Item	Implementation (dollars)	Quarterly Operation (dollars)
Participation reimbursement	1,275	1,275
Characterization	365	365
Expendable material	385	385
Travel	1,825	555
Computer processing	130	130
Labor	3,333	3,333
Total	7,313	6,043

in the figures, each implementation will cost $7,313 and thereafter each quarterly followup will cost $6,043.

Based upon the schedule presented in Figure 6 and the individual implementation and operation cost presented in Table 13, the cost for the total systems operation on a fiscal year basis is presented in Table 14. As reflected in Table 14, the implementation and operation cost for FY '72 is $218,162. This cost increases to $510,766 in FY '75 and should remain at that level as long as the data system is continued to be operated at the 30 SMSA continuous monitor level.

The yearly total cost figures in Table 14 do not include the cost for developing the disposal computer program or the pilot program for commercial and transportation data; therefore, the $12,000 for disposal programs and the $70,000 for the commercial and transportation data pilot program must be added to the FY '72 figure for a grand total of $302,202 requirement for that year.

Figure 7 reflects the schedule through FY '76. It includes the implementation of the disposal refinement and commercial and transportation data system pilot program into the total program. It is only after the completion of the commercial and transportation pilot program that the total cost of the implementation and operation of this system can be determined since those costs must be added to the cost reflected in Table 14 in order to determine the total.



FY'72 10 Implementations
24 Quarterly operations

FY'73 12 Implementations
70 Quarterly operations

FY'74 5 Implementations
113 Quarterly operations

FY'75 120 Quarterly operations

Figure 6. Implementation and operation schedule (residential)

TABLE 14

COST FOR FISCAL YEAR TOTAL SYSTEMS COST

Fiscal Year	Number of Implementations	Cost of Implementations (dollars)	Number of Operations	Cost of Implementations (dollars)	Yearly Total (dollars)
72	10	73,130	24	145,032	218,162*
73	12	87,756	70	423,010	510,766
74	5	36,565	113	682,859	719,424
75	0	0	120	725,160	725,160

* $82,000 must be added to this figure for the disposal refinement and the commercial and transportation pilot program.

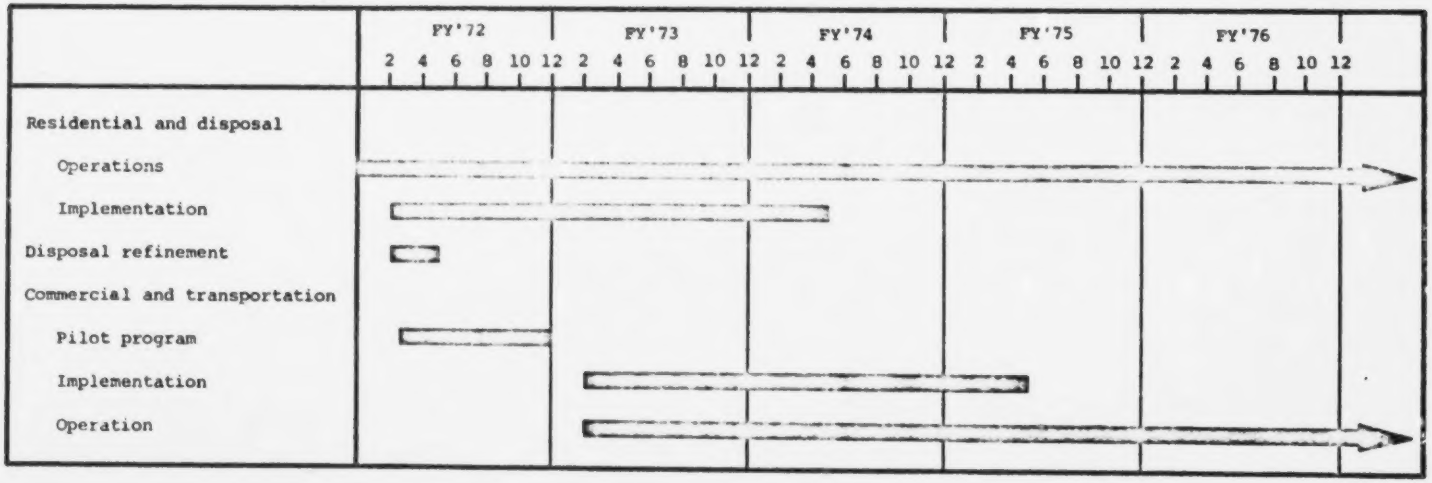


Figure 7. Program schedule

RECOMMENDATIONS

This section of the report contains specific recommendations which are a result of the activities conducted and experience gained during the pilot program. They are not necessarily listed in order of priority; however, the most critical recommendations are generally higher in the listing.

It is recommended that:

1. *The pilot program as described in this book be continued in operation as a basis of a national network and immediate expansion of the system be accomplished as described in the concept of implementation section.* In the expansion the Bureau of Solid Waste Management maintain positive control over the system, but team with the contractor in the implementation and operation of the data system. In this arrangement, the Bureau would maintain total direction and control of the system and would be the primary interface with all organizations using information from the system. This would include the answering of inquiries and providing the output information to various local government and private users across the United States. The contractors responsibility would be primarily that of gathering, validating, and processing the data into the National Data Network. Tbis arrangement would provide cross checks on the operation to assure an accurate

and valid system.

2. *Organizations involved in the data system including the Bureau and the contractor should be stablized.* By this, it is meant that key people within the Bureau operation should be maintained constant over an extended period of time to assure a constant objective of the program and key people in the contractors operation should remain constant over an extended period of time to assure continuity in the data gathering operation. Pertubation in these areas will cause rapid deterioration of the data system.
3. *The Bureau should identify and select one competent contractor to operate the data collection portion of the system.* Multi contractors will tend to erode the validity of the data base and the ability to compare like data across the United States. This is most critical in like data; that is, the same contractor at least should collect all residential data on all samples across the nation. If it is necessary to split the program, it could be split in types of data. For example, one contractor could collect all residential data while another collects all commercial data. This approach is not recommended since it will increase the cost of operating the system.
4. *Emphasis should be placed on personal contact with Participants*

and this emphasis be maintained throughout the program. During the pilot program it became obvious that it was necessary to establish personal contact with the people involved in providing the data into the system. It was equally important to continually maintain this relationship in order to receive valid data in a timely manner. In maintaining good relationships it was necessary to visit the people periodically to reimburse them a reasonable amount for their effort and to provide them results of the national system.

5. *All data entering the national data network should be validated by an individual who has first hand knowledge of the route or facility from which the data is being received.* This is necessary since the structure of the data system is based on using a minimum number of routes summed together to depict SMSA which in turn will be summed to depict a region and in turn summed to depict the nation. Incorrect data on a small number of routes could drastically distort the system.
6. *The characterization of residential solid waste should continue as a major portion of the data network.* An accurate knowledge of the composition of solid waste across the United States will be invaluable in understanding the total solid waste problem and in developing future disposal and/or recycling techniques.

7. *Top priority should be given in obtaining the data element of weight from each sampled route.* In accomplishing the analysis of a given operation or in developing correlations and factors, weight has been found to be one of the key elements. In fact, it is the only element with the necessary accuracy for determining generation rates and and work performance. At present, it is the most expensive element to obtain in that it involves cost of the additional time for the vehicle and crew to proceed to the nearest scales and the cost involved in the actual weighing. Portable scales proved unsatisfactory in that the normal solid waste collection crews are not skilled in portable scale operation. Perhaps an economical answer to this problem can be found in instrumentation.
8. *In all cases followup should be accomplished on commitments to data providers within a minimum period of time.* In no case should a period of greater than 90 days elapse between a contact and implementation or a commitment and followup. Excellent results occurred during the pilot program when this rule appears to indicate to the potential participants or the actual participants as a lack of interest in him and his operation. In all cases it significantly amplified the problem of maintaining good relations and in obtaining valid data in a timely manner.
9. *A letter should be prepared for each perspective participant*

which clearly defines what is expected from them and what will be provided to them during the effort. The letter should be provided to the potential participants either during the initial visit or the implementation visit. The time frame between this initial visit and the implementation visit should be within one to two weeks. Longer time periods and/or lack of documentation lead to confusion and misunderstandings during the pilot program.

APPENDIX A

SAMPLE REPORTS

Appendix A contains 17 packages of reports. Each package contains six individual reports. The packages are divided into two groups. The first group contains reports covering one months operation (a calendar month). The second group contains reports which cover periods of two weeks each. (The reporting period starts on Saturday and ends on a Friday).

The potential user should be certain that he understands the limitations of the data and the purpose for which it was developed before attempting to use it.

```
**************************************************************************************************************

                              ROUTE DETAILED REPORT                    March 1971

**************************************************************************************************************

CONTROL NO.                              ROUTE CHARACTERISTICS
               LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVD  SEPR REQD  AVG WEIGHT/DAY

 478004007.       14.         YARD    LND FILL    2./WK     0.724      YES          6445.
 478006013.       23.         YARD    LND FILL    2./WK     0.936      YES         10863.
 478006011.       11.         YARD    INCNRATR    3./WK     1.314      YES         18420.
 478006012.       11.         YARD    INCNRATR    3./WK     0.602      YES         17232.
 511002001.        2.         YARD    INCNRATR    1./WK     0.219      NO          14803.
 511002002.        5.         YARD    INCNRATR    1./WK     0.272      NO          22219.
 511005003.        6.         CURB    LND FILL    1./WK     0.431      NO          21038.
 681001011.       11.         CURB    LND FILL    2./WK     0.579      NO          10982.
 681003012.        4.         ALLY    LND FILL    2./WK     0.200      NO           9370.
 681007005.       71.         ALLY    XFER STA    2./WK     3.181      NO          49771.
 681007013.       39.         ALLY    LND FILL    2./WK     3.181      NO          49649.
 681007006.       55.         ALLY    XFER STA    2./WK     1.737      NO          38095.
 681007014.       32.         ALLY    LND FILL    2./WK     1.737      NO          41408.



**************************************************************************************************************

                         VEHICLE - CREW DETAILED REPORT

**************************************************************************************************************
                                                                  March 1971
CONTROL NO.                               VEHICLE CHARACTERISTICS
                                                                                        CREW CHARACTERISTICS
              TYPE          SIZE      AGE  LIFE EXP   COST   MAINT C/OP HR  CONSU C/OP HR  SIZE  HRLY RATE  WRK HRS/WK

 478004007.  REAR LOADER   25.CU YDS   3.     5.     18000.      0.180          0.338        4.     2.50       32.0
 478006001.  SIDE LOADER   20.CU YDS   4.     3.      8500.      0.960          0.473        3.     2.54       16.0
 478006010.  FRONT LOADER  25.CU YDS   1.    10.     23300.      0.660          0.695        4.     2.57       50.0
 478006012.  FRONT LOADER  25.CU YDS   2.    10.     23300.      1.500          0.550        4.     2.54       50.0
 511002001.  REAR LOADER   16.CU YDS   4.     5.     18000.      2.880          0.715        4.     4.10       40.0
 511002002.  REAR LOADER   16.CU YDS   4.     5.     18000.      2.880          0.574        4.     4.09       40.0
 511005003.  REAR LOADER   25.CU YDS   1.     5.     24000.      0.960          0.466        3.     3.33        8.0
 681001011.  SIDE LOADER   20.CU YDS   5.    10.      7365.      0.120          0.252        2.     2.54       16.0
 681003012.  SIDE LOADER   20.CU YDS   6.    10.      9170.      0.300          0.403        3.     1.95       16.8
 681007005.         TRAIN  19.CU YDS   5.     4.     17560.      3.100          1.266       11.     2.05       32.0
 681007013.  FRONT LOADER  24.CU YDS   6.     8.     28500.      0.960          1.309        0.     2.47       32.0
 681007006.         TRAIN  18.CU YDS   6.     4.     17560.      3.420          1.020       12.     2.07       32.0
 681007014.  FRONT LOADER  26.CU YDS   5.    80.     28500.      0.960          0.961        1.     2.61       32.0
```

OPERATIONS DETAILED REPORT March 1971

CONTROL	POOL TO START OF ROUTE DISTANCE	POOL TO START OF ROUTE TIME	COLLECTION DISTANCE	COLLECTION TIME	TRANSPORTATION DISTANCE	TRANSPORTATION TIME	TIME COL/ RESID SVC	QTY GEN/ RESID/DAY	QTY GEN/ PERSON/DAY
478004007.	0.0	0.0	1.65	297.00	2.85	90.00	0.56	3.60	1.10
478006038.	4.20	14.17	21.26	466.83	20.24	20.56	0.11	0.71	0.26
478006039.	2.55	14.36	5.00	394.64	4.25	133.64	0.92	19.28	6.62
478006010.	1.35	0.22	15.05	342.46	21.15	105.30	0.77	16.55	5.54
511002001.	3.74	16.09	3.17	123.70	20.47	91.78	0.20	4.92	1.80
511002002.	2.52	24.70	4.69	273.74	36.50	174.06	1.26	14.63	3.00
511005003.	2.00	12.75	14.00	252.50	41.00	171.25	0.59	7.03	1.63
631001011.	0.37	6.00	4.40	302.22	6.90	41.67	0.90	9.26	2.58
681003012.	1.35	11.62	7.44	332.44	12.14	105.00	1.05	7.52	2.15
681007005.	20.10	24.32	71.04	472.61	0.0	0.0	0.17	5.70	1.76
681007013.	5.40	22.25	0.0	0.0	42.58	480.00	0.0	5.69	1.75
681007006.	6.05	26.73	54.50	420.33	0.0	0.0	0.19	4.88	1.51
681007014.	5.40	30.00	0.0	0.0	38.87	480.00	0.0	5.31	1.65

COST BREAKDOWN DETAILED REPORT March 1971

CONTROL	COST TRAV TO ROUT/D	EQ COST COL/DAY	MP COST COL/DAY	TOT COST TO COL/DAY	EQ COST TO TRANSP/DA	MP COST TRANSP/DA	TOT COST TRANSP/DA	RATIO PROD TO PAID TIME	COST/DAY	COST/SQ MILE/WEEK
478004007.	0.0	10.76	47.83	58.59	3.00	13.33	16.33	0.799	93.76	518.00
478006038.	2.46	21.75	69.29	91.03	4.17	11.37	15.55	1.000	99.04	211.51
478006039.	3.05	16.35	79.30	95.55	5.49	22.90	28.39	0.527	125.22	507.26
478006010.	2.05	19.07	57.16	76.22	5.54	17.85	23.39	0.309	125.69	907.79
511002001.	5.43	10.98	32.30	43.28	8.15	23.97	32.12	0.555	145.91	3332.49
511002002.	8.65	23.66	72.27	95.93	15.46	47.25	62.71	0.996	167.99	3086.04
511005003.	12.03	15.72	42.21	57.98	10.66	28.51	39.17	0.934	107.15	248.60
631001011.	0.43	3.44	25.50	29.27	0.51	3.53	4.04	0.753	44.89	155.07
681003012.	1.35	6.02	32.41	38.43	1.02	10.24	12.16	0.507	57.35	573.46
681007005.	11.71	45.64	161.16	206.70	0.0	0.0	0.0	0.957	228.36	287.14
681007013.	1.49	0.0	0.0	0.0	31.85	0.0	31.85	1.000	33.33	41.91
681007006.	14.33	46.76	177.62	224.39	0.0	0.0	0.0	0.959	248.73	572.77
681007014.	2.99	0.0	0.0	0.0	16.74	20.94	37.59	1.000	40.56	93.41

```
*************************************************

      POPULATION CHARACTERISTICS            March 1971

*************************************************

CONTROL NO.     ECON LV  RES SVD  PROD SVD

 478004017.        8.     1023.     3325.
 478006008.        4.     4501.    11750.
 478016010.        3.      773.     1550.
 478016019.        1.      745.     3224.
 511002001.        2.     2147.     6602.
 511002002.        2.     1085.     5257.
 511005003.        9.      429.     1835.
 681011011.       99.      360.     1216.
 681011012.        5.      310.     1113.
 681017008.        7.     4553.    16133.
 681017013.        7.     4553.    16133.
 681027006.        7.     4460.    14380.
 681027014.        7.     4460.    14380.
```

```
******************************************************************************************************

                                          SUMMARY REPORT          March 1971

******************************************************************************************************

CONTROL       PEOPLE S/WK  LGT OF ROUT  WEIGHT/DAY  COST/DAY  RATIO PROD/PD  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478004017.      3325.        27.00        6445.       94.        0.709          1.10      29.09        0.11          0.37
 478006008.     11750.        23.26       10863.       69.        1.000          0.26      18.23        0.02          0.05
 478016010.      1550.        16.06       12422.      125.        0.927          6.62      13.60        0.31          0.87
 478016019.      3224.        17.44       17232.      126.        0.800          5.54      14.59        0.29          0.85
 511002001.      6602.        14.26       14003.      146.        0.555          1.80      10.71        0.12          0.34
 511002002.      5227.        23.46       22218.      169.        0.806          3.00      15.12        0.16          0.77
 511005003.      1813.         6.00       21038.      107.        0.934          1.63      10.19        0.06          0.25
 681011011.      1216.        10.40       10582.       45.        0.753          2.58       8.18        0.07          0.24
 681011012.      1113.         5.40        9370.       57.        0.837          2.15      13.70        0.10          0.36
 681017008.     16133.       142.07       45771.      228.        0.957          1.76       9.19        0.06          0.18
 681017013.     16134.        77.53       40645.       33.        1.000          1.76       1.34        0.01          0.03
 681027006.     14380.       100.00       38095.      249.        0.959          1.51      13.06        0.07          0.22
 681027014.     14380.        77.82       41458.       41.        1.000          1.65       1.96        0.01          0.04
```

```
*****************************************************************************************************************

                              VEHICLE - CREW DETAILED REPORT                    February 1971

*****************************************************************************************************************

CONTROL NO.                                  VEHICLE CHARACTERISTICS                                  CREW CHARACTERISTICS
                 TYPE          SIZE     AGE  LIFE EXP    COST   MAINT C/OP HR   CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

 473004007.  REAR LOADER   25.CU YDS    2.      5.      18000.       0.180           0.329         4.     2.50        32.0
 473006008.  SIDE LOADER   20.CU YDS    4.      3.       8500.       0.360           0.493         3.     2.54        16.0
 511002001.  REAR LOADER   16.CU YDS    4.      5.      18000.       2.890           0.752         4.     4.09        40.0
 511002002.  REAR LOADER   16.CU YDS    4.      5.      18000.       2.880           0.508         4.     4.09        40.0
 511005003.  REAR LOADER   25.CU YDS    1.      5.      24000.       0.960           0.479         3.     3.33         8.0
 681001011.  SIDE LOADER   20.CU YDS    4.     10.       7465.       0.120           0.282         2.     2.54        16.0
 681003012.  SIDE LOADER   18.CU YDS    4.     10.       7304.       0.300           0.435         3.     1.95        16.8
 681007005.        TRAIN   18.CU YDS    5.      4.      17560.       3.000           1.180        11.     2.03        32.0
 681007013.  FRONT LOADER  26.CU YDS    5.      9.      28500.       0.960           1.003         0.     2.45        32.0
 681007006.        TRAIN   18.CU YDS    5.      4.      17560.       3.420           1.076        12.     2.09        32.0
 681007014.  FRONT LOADER  26.CU YDS    5.     80.      28500.       0.960           1.129         1.     2.60        32.0
```

```
*****************************************************************************************************************

                              ROUTE DETAILED REPORT                    February 1971

*****************************************************************************************************************

CONTROL NO.                          ROUTE CHARACTERISTICS
            LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVD  SEPR REQD  AVG WEIGHT/DAY

 473004007.     14.        YARD    LND FILL    2./WK     0.724       YES          4913.
 473006008.     24.        YARD    LND FILL    2./WK     0.336       YES         10859.
 511002001.      3.        YARD    INCNRATR    1./WK     0.226       NO          14928.
 511002002.      5.        YARD    LND FILL    1./WK     0.278       NO          19728.
 511005003.      6.        CURB    LND FILL    1./WK     0.431       NO          20000.
 681001011.     11.        CURB    LND FILL    2./WK     0.579       YES         10065.
 681003012.      6.        ALLY    LND FILL    2./WK     0.200       YES          7069.
 681007005.     73.        ALLY    XFER STA    2./WK     2.958       NO          36309.
 681007013.     41.        ALLY    LND FILL    2./WK     2.958       NO          36307.
 681007006.     55.        ALLY    XFER STA    2./WK     1.749       NO          31100.
 681007014.     33.        ALLY    LND FILL    2./WK     1.749       NO          34343.
```

```
*******************************************************************************************
                              OPERATIONS DETAILED REPORT          February 1971
*******************************************************************************************
CONTROL       [illegible] START OF ROUTE      COLLECTION           TRANSPORTATION      TIME COL/    QTY GEN/    QTY GEN/
               DISTANCE      TIME        DISTANCE     TIME      DISTANCE     TIME     RESID SVD   RESID/DAY  PERSON/DAY

 478004337.       0.0          0.14        5.52      254.21      10.37       90.71      0.50        2.74        0.84
 478006373.       5.29        15.[illegible]  23.74  437.10      17.00       73.21      0.32        6.35        2.39
 511002001.       2.72        17.01        3.44      161.7[illegible]  22.44  96.17     0.38        5.01        1.83
 511002002.       2.33        2[illegible].41  4.70  203.05      21.36      143.56      1.36       13.17        2.70
 511005333.       2.00        10.30       13.75      249.75      40.75      179.75      0.56        6.45        1.50
 681001011.       1.01         5.00        8.20      265.88       5.64       20.00      0.70        7.57        2.36
 681002012.       1.63        10.00        6.26      311.25      10.00       95.00      0.98        6.35        1.81
 681007005.  [illegible]      24.17       65.[illegible]  [illegible]  0.0    0.0       0.16        4.25        1.32
 681007013.       5.40        22.38        0.0        0.0        44.35      480.00      0.0         4.25        1.32
 681007006.       7.17        26.27       64.71      481.[illegible]  0.0    0.0       0.17        4.06        1.26
 681007014.       5.40        24.00        0.0        0.0        30.03      480.00      0.0         4.49        1.35

*******************************************************************************************
                              COST BREAKDOWN DETAILED REPORT          February 1971
*******************************************************************************************
CONTROL       COST TRAV   FO COST    MP COST   TOT COST  FO COST TO   MP COST    TOT COST   RATIO PROD               COST/SQ
              TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY TRANSP/DA  TRANSP/DA  TRANSP/DA  TO PAID TIME  COST/DAY  MILE/WEEK

 479004337.      0.03       9.64      43.04      52.67       3.01      13.45      16.46       0.746       52.65     511.50
 479006373.      2.41      20.51      55.52      76.03   [illegible] [illegible]  12.23       1.000       90.87     194.06
 511002001.      4.32      14.44      44.11      58.57       7.70      23.49      31.20       0.622      154.61    3423.20
 511002002.      1.11      26.25      76.00     102.[illegible]  11.67  41.53     53.10       0.974      170.47    3066.05
 511005333.      2.29      15.53      41.42      56.95      11.16      29.75      40.92       0.934      107.24     248.81
 681001011.      0.49       3.38      22.60      25.98       0.37       2.46       2.82       0.650       44.46     153.56
 681002012.      1.16       5.64      30.35      35.98       1.72       9.26      10.98       0.809       56.68     566.77
 681007005.     11.43      41.53     147.01     193.54       0.0        0.0        0.0        0.903      222.25     300.59
 681007013.      1.53       0.0        0.0        0.0       29.40       0.0       29.40       1.000       30.84      41.71
 681007006.     12.11      42.05     155.00     201.92       0.0        0.0        0.0        0.979      245.93     562.47
 681007014.      3.03       0.0        0.0        0.0       17.09      20.73      38.98       1.000       41.96      95.96
```

```
**************************************************
     POPULATION CHARACTERISTICS          February 1971
**************************************************
CONTROL NO.   FACILTY  RES SVD  PROP SVD

 479004007.       9.    1023.    3335.
 479006008.       4.     435.    1306.
 511002001.       2.    2125.    6621.
 511002002.       2.    1070.    5214.
 511005003.       4.     443.    1005.
 681001011.      30.     390.    1216.
 681003012.       5.     319.    1113.
 681007006.       7.    4078.   15764.
 681007013.       7.    4078.   15764.
 681007014.       7.    4275.   14121.
 681007016.       7.    4275.   14121.
```

```
****************************************************************************************************
                                        SUMMARY REPORT
                                                                  February 1971
****************************************************************************************************
CONTROL      PEOPLE SVD  LBS OF POLL  WEIGHT/DAY  COST/DAY  RATIO PROD/PC  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 479004007.     3335.       27.00        4513.        93.         0.746          0.94       37.72        0.11          0.36
 479006008.     1306.       23.00       10865.        91.         1.000          2.39       16.72        0.14          0.37
 511002001.     6621.       13.33       14529.       155.         0.622          1.93       33.71        0.13          0.36
 511002002.     5214.       23.40       15729.       170.         0.974          2.70       17.29        0.16          0.80
 511005003.     1035.        6.20       20000.       107.         0.934          1.50       10.72        0.06          0.24
 681001011.     1216.       10.60       10065.        44.         0.659          2.36        9.93        0.07          0.23
 681003012.     1113.        5.60        7069.        57.         0.849          1.81       16.04        0.10          0.36
 681007006.    15764.      130.38       36309.       222.         0.900          1.32       12.24        0.06          0.18
 681007013.    15764.       91.08       36307.        71.         1.033          1.32        1.76        0.31          0.03
 681007014.    14121.      103.45       31100.       266.         0.774          1.26       15.87        0.07          0.22
 681007016.    14121.       79.15       34343.        47.         1.303          1.39        2.44        0.01          0.04
```

```
*******************************************************************************************************

                         VEHICLE - CREW DETAILED REPORT                  January 1971

*******************************************************************************************************

CONTROL NO.
                                         VEHICLE CHARACTERISTICS                                    CREW CHARACTERISTICS
                TYPE          SIZE      AGE  LIFE EXP   COST   MAINT C/OP HR   CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

 478006007.   REAR LOADER   25.CU YDS    2.     5.     18000.      0.190           0.330          4.     2.50        32.0
 478006312.   SIDE LOADER   20.CU YDS    4.     3.      9500.      0.360           0.509          3.     2.54        16.0
 511012011.   REAR LOADER   16.CU YDS    4.     5.     12000.      2.180           0.722          4.     4.08        40.0
 511012012.   REAR LOADER   16.CU YDS    4.     4.     18000.      2.880           0.629          4.     4.08        40.0
 511025013.   REAR LOADER   25.CU YDS    1.     5.     24000.      0.960           0.479          3.     3.23         8.0
 511000036.   REAR LOADER   25.CU YDS    2.     3.     23500.      1.260           1.037          3.     3.00        40.0
 681011111.   SIDE LOADER   20.CU YDS    4.    10.      7465.      0.120           0.256          2.     2.54        16.0
 681002312.   SIDE LOADER   16.CU YDS    3.    10.      9170.      0.300           0.492          3.     1.95        16.8
 511007306.         TRAIN   16.CU YDS    4.     4.     17560.      3.420           1.140         11.     2.12        32.0
 681007312.  FRONT LOADER   24.CU YDS    4.     8.     28500.      0.960           1.116          1.     2.58        32.0
 681007336.         TRAIN   18.CU YDS    4.     4.     17560.      3.420           1.049         12.     2.05        32.0
 681037114.  FRONT LOADER   26.CU YDS    4.     8.     28500.      0.960           0.740          1.     2.55        32.0


*******************************************************************************************************

                         ROUTE DETAILED REPORT                           January 1971

*******************************************************************************************************

CONTROL NO.
                                        ROUTE CHARACTERISTICS
             LENGTH/DAY   TYPE SERV   DISCG PT   SCHEDULE   AREA SVD   SEPR RECC   AVG WEIGHT/DAY

 478006007.      14.        YARD      LND FILL    2./WK      0.724       YES           3744.
 478006014.      26.        YARD      LND FILL    2./WK      0.033       YES          11213.
 511012011.       6.        YARD      INCNRATR    1./WK      0.333       NO           13191.
 511012012.       6.        YARD      LND FILL    1./WK      0.270       NO           20260.
 511025007.       6.        CURB      LND FILL    1./WK      0.431       YES          24309.
 511000036.       4.        CURB      LND FILL    1./WK      2.450       NO           28124.
 681001011.      11.        CURB      LND FILL    2./WK      0.579       YES           9825.
 681002012.       7.        ALLY      LND FILL    2./WK      0.200       YES           7572.
 681007306.      71.        ALLY      XFER STA    2./WK      3.100       NO           44596.
 681007014.      34.        ALLY      LND FILL    2./WK      3.100       NO           44592.
 681007336.      54.        ALLY      XFER STA    2./WK      1.667       NO           34234.
 681007014.      39.        ALLY      LND FILL    2./WK      1.667       NO           34034.
```

OPERATIONS DETAILED REPORT

January 1971

CONTROL	POOL TO START OF ROUTE		COLLECTION		TRANSPORTATION		TIME COL/ RESID SVD	QTY GEN/ RESID/DAY	QTY GEN/ PERSON/DAY
	DISTANCE	TIME	DISTANCE	TIME	DISTANCE	TIME			
479004007.	0.53	0.70	15.50	253.60	29.20	84.50	0.50	2.09	0.64
479016003.	4.21	16.19	24.86	444.41	10.12	77.35	0.91	6.56	2.46
511002001.	3.30	12.55	3.80	132.05	25.16	85.75	0.31	4.40	1.61
511002002.	4.36	26.55	4.70	262.35	42.23	167.85	1.22	13.52	2.78
511005003.	2.00	10.33	13.00	266.25	40.00	145.00	0.73	9.55	2.22
511999004.	21.00	60.00	4.00	330.00	57.14	183.33	0.61	7.48	1.85
681001011.	1.00	5.00	5.00	267.50	5.33	35.63	0.70	7.39	2.31
681003012.	1.56	11.67	4.60	323.33	13.41	96.07	1.02	6.81	1.55
681007005.	25.20	27.36	71.45	426.36	0.0	0.0	0.17	5.07	1.57
681007013.	5.40	32.21	0.0	0.0	30.56	490.00	0.0	5.07	1.57
681007006.	6.83	21.13	53.56	407.53	0.0	0.0	0.18	4.32	1.34
681007014.	5.40	33.00	0.0	0.0	37.76	480.00	0.0	4.29	1.33

COST BREAKDOWN DETAILED REPORT

January 1971

CONTROL	COST TRAV TO ROUTE/D	EQ COST COL/DAY	MP COST COL/DAY	TOT COST TO COL/DAY	EQ COST TO TRANSP/DA	MP COST TRANSP/DA	TOT COST TRANSP/DA	RATIO PROD TO PAID TIME	COST/DAY	COST/SQ MILE/WEEK
479004007.	0.14	9.47	42.27	51.74	3.16	14.08	17.24	0.746	92.66	511.91
479016003.	2.82	10.97	66.44	77.41	3.65	9.82	13.47	1.000	93.70	201.17
511002001.	4.27	11.74	39.46	51.20	7.98	26.88	34.86	0.552	164.59	3740.58
511002002.	13.41	22.91	78.43	101.34	14.66	50.18	64.84	0.963	192.42	3299.89
511005003.	2.22	16.62	44.33	60.95	9.05	24.14	33.19	0.908	106.27	246.44
511999004.	15.06	33.35	49.50	82.85	18.53	27.50	46.03	1.000	143.94	293.75
681001011.	3.69	3.28	22.65	25.93	0.44	3.01	3.45	0.672	44.41	153.42
681003012.	1.27	6.33	31.52	37.85	1.89	9.43	11.32	0.979	57.50	575.89
681007005.	12.44	47.40	165.43	212.83	0.0	0.0	0.0	0.957	236.69	296.09
681007013.	2.73	0.0	0.0	0.0	30.31	10.31	40.62	1.000	43.35	54.23
681007006.	10.99	44.58	166.59	211.67	0.0	0.0	0.0	0.914	243.68	584.77
681007014.	3.78	0.0	0.0	0.0	27.30	20.39	47.69	1.000	51.46	123.50

```
**********************************************
     POPULATION CHARACTERISTICS        January 1971
**********************************************
CONTROL NO.    PEOPLE/WK  RES SVD  PROD SVD

478004007.         5.      1023.     2235.
478008008.         4.       487.     1200.
511001001.         2.      2141.     5665.
511002002.         2.      1670.     5214.
511005003.         9.       345.     1570.
511009004.         7.      2665.    10640.
681001011.        90.       350.     1216.
681002012.         5.       216.     1113.
681007005.         7.      5024.    16234.
681007013.         7.      5024.    16234.
681007306.         7.      4521.    14622.
681007014.         7.      4521.    14622.
```

```
*****************************************************************************************************************
                                                SUMMARY REPORT          January 1971
*****************************************************************************************************************
CONTROL        PEOPLE S/WK  LGT OF BELT  WEIGHT/DAY  COST/DAY  RATIO PROD/PC  QTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

478004007.        2235.        27.00        3744.        93.        0.746          0.64       49.50         0.11          0.36
478006007.        1200.        24.86       11213.        96.        1.000          2.44       16.71         0.14          0.38
511001001.        5665.        19.35       13151.       165.        0.557          1.61       24.96         0.14          0.38
511002002.        5214.        33.50       20260.       183.        0.961          2.78       18.11         0.18          0.86
511005003.        1570.         6.00       24306.       176.        0.998          2.22        9.71         0.07          0.29
511009004.       10640.        20.00       29124.       144.        1.000          1.89       10.24         0.07          0.27
681001011.        1216.        10.60        5925.        44.        0.672          2.31        9.04         0.07          0.23
681002012.        1113.         5.60        7579.        58.        0.878          1.95       15.20         0.10          0.36
681007005.       16234.       142.90       44504.       227.        0.957          1.57       10.62         0.06          0.19
681007013.       16234.        76.72       44552.        43.        1.000          1.57        1.94         0.01          0.03
681007306.       14622.       107.12       34234.       244.        0.914          1.34       14.24         0.07          0.22
681007014.       14622.        75.63       34034.        51.        1.000          1.33        3.02         0.01          0.05
```

```
************************************************************************************************************************
                              VEHICLE - CREW DETAILED REPORT          December 1970
************************************************************************************************************************
CONTROL NO.                                   VEHICLE CHARACTERISTICS                                  CREW CHARACTERISTICS
                  TYPE           SIZE      AGE  LIFE EXP    COST    MAINT C/OP HR  CONSU C/OP HR   SIZE  HRLY RATE  WRK HRS/WK

 479006008.   SIDE LOADER    20.CU YDS     3.      3.       8500.       0.960          0.398        3.      2.54       16.0
 511002001.   REAR LOADER    20.CU YDS     4.      5.      19000.       2.880          0.692        6.      4.06       40.0
 511002002.   REAR LOADER    16.CU YDS     4.      5.      19000.       2.890          0.554        6.      4.06       40.0
 511005003.   REAR LOADER    25.CU YDS     1.      5.      24000.       0.960          0.504        3.      3.33        8.0
 511009004.   REAR LOADER    25.CU YDS     1.      3.      23500.       1.260          0.901        3.      3.00       40.0
 681001011.   SIDE LOADER    20.CU YDS     4.     10.       7465.       0.120          0.301        2.      2.54       16.0
 681003012.   SIDE LOADER    16.CU YDS     4.     10.       7304.       0.300          0.429        3.      1.95       16.8
 681007005.         TRAIN    18.CU YDS     4.      4.      17560.       3.420          1.394       11.      2.03       32.0
 681007013.  FRONT LOADER    26.CU YDS     4.      9.      28500.       0.960          1.323        1.      2.50       32.0
 681007006.         TRAIN    15.CU YDS     4.      4.      17560.       2.420          1.271       12.      2.10       32.0
 681007014.  FRONT LOADER    26.CU YDS     4.      9.      28500.       0.960          0.970        1.      2.57       32.0
```

```
************************************************************************************************************************
                              ROUTE DETAILED REPORT          December 1970
************************************************************************************************************************
CONTROL NO.                                 ROUTE CHARACTERISTICS
              LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVC  SEPR RECD  AVG WEIGHT/DAY

 479006008.       22.        YARD    LND FILL    2./WK      0.344      YES         11404.
 511002001.        4.        YARD    LND FILL    1./WK      0.211      NO          12671.
 511002002.        5.        YARD    INCNRATR    1./WK      0.292      NO          16891.
 511005003.        6.        CURB    LND FILL    1./WK      0.566      YES         18393.
 511009004.        4.        CURB    LND FILL    1./WK      2.450      NO          20067.
 681001011.       11.        CURB    LND FILL    2./WK      0.579      NO          10158.
 681003012.        6.        ALLY    LND FILL    2./WK      0.230      YES          6579.
 681007005.       72.        ALLY    XFER STA    3./WK      1.224      NO          40772.
 681007013.       42.        ALLY    LND FILL    2./WK      2.224      NO          40742.
 681007006.       52.        ALLY    XFER STA    2./WK      1.594      NO          37834.
 681007014.       40.        ALLY    LND FILL    2./WK      1.594      NO          37834.
```

```
********************************************************************************************************
                         OPERATIONS DETAILED REPORT        December 1970
********************************************************************************************************
CONTROL      DIST TO START OF ROUTE     COLLECTION          TRANSPORTATION       TIME COL/   QTY GEN/    QTY GEN/
               DISTANCE    TIME       DISTANCE    TIME     DISTANCE    TIME      RESID SVD   RESID/DAY   PERSON/DAY

 478006008.      4.19      15.55       21.56     470.59     20.65      99.12      0.96        6.64        2.49
 511002001.      3.13      11.17        3.65     113.00     36.71     125.17      0.26        4.71        1.54
 511002002.      4.28      17.23        5.35     214.92     33.19     173.77      0.97       10.86        2.22
 511005001.      1.00      13.00        6.25     213.75     48.25     292.59      0.46        5.49        1.27
 511099004.     21.00      60.00        4.00     318.91     59.70     200.70      0.59        7.73        1.55
 681001011.      1.00       5.00        5.44     240.00      5.23      33.09      0.63        7.64        2.39
 681003012.      2.11       9.44        7.56     327.78     12.64      97.22      1.03        5.91        1.69
 681007005.     23.66      30.00      115.55     434.00      0.0        0.0       0.17        4.60        1.42
 681007013.      5.43      38.00        0.0        0.0      39.55     480.00      0.0         4.59        1.42
 681007006.      7.19      15.00       52.11     430.06      0.0        0.0       0.20        5.01        1.55
 681007014.      5.49      30.00        0.0        0.0      40.16     480.00      0.0         5.44        1.55
```

```
**********************************************************************************************************
                          COST BREAKDOWN DETAILED REPORT        December 1970
**********************************************************************************************************
CONTROL      COST TRAV   EQ COST    MP COST   TOT COST   EQ COST TO   MP COST    TOT COST   RATIO PROD                COST/SQ
             TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME   COST/DAY   MILE/WEEK

 478006008.     2.69      21.33      69.76     91.10       4.04        11.32      15.36       1.000        95.14      210.03
 511002001.     5.52       9.70      44.66     54.36      11.04        50.92      61.96       0.562       216.61     5125.57
 511002002.     3.69      19.49      87.22    106.71      15.47        72.99      88.46       0.990       230.33     3949.47
 511005001.     7.23      13.75      39.42     53.17      12.73        33.72      46.45       0.924       107.03      189.27
 511099004.    14.93      31.50      47.84     79.34      19.83        30.10      49.93       1.000       144.20      294.28
 681001011.     0.44       3.12      21.33     24.45       0.43         2.80       3.23       0.614        44.25      152.87
 681003012.     1.09       5.50      31.56     37.86       1.75         9.48      11.23       0.991        56.96      569.64
 681007005.    14.63      50.09     161.58    211.67       0.0          0.0        0.0        0.974       232.26      288.15
 681007013.     4.11       0.0        0.0       0.0       31.97        20.01      51.97       1.000        56.09       69.58
 681007006.     7.03      49.75     180.41    229.16       0.0          0.0        0.0        0.942       251.81      632.09
 681007014.     3.03       0.0        0.0       0.0       29.14        20.56      49.70       1.000        53.64      134.63
```

```
*****************************************************

      POPULATION CHARACTERISTICS          December 1970

*****************************************************

CONTROL NO.     ECON LV  RES SVD  PEOP SVD

 479006009.        4.      451.     1311.
 511002101.        2.     2152.     5396.
 511002002.        4.     1110.     5426.
 511005003.        8.      460.     2062.
 511002006.        7.     2655.    10643.
 681001011.       99.      350.     1216.
 681003012.        5.      218.     1113.
 681007005.        7.     5069.    14379.
 681007011.        7.     5063.    14373.
 681007006.        7.     4213.    13932.
 681007014.        7.     3576.    13936.
```

```
**************************************************************************************************************

                                                  SUMMARY REPORT          December 1970

**************************************************************************************************************

CONTROL        PEOPLE S/WK  LGT OF ROUT  WEIGHT/DAY  COST/DAY  RATIO PRCP/PP  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 479006009.       1311.        21.96       11404.       99.        1.000          2.49        17.39        0.15          0.40
 511002101.       5396.        19.01       12671.      217.        0.567          1.54        34.19        0.18          0.50
 511002002.       5426.        26.73       16401.      250.        0.340          2.22        27.27        0.21          1.04
 511005003.       2062.         6.00       10398.      107.        0.924          1.27        11.64        0.05          0.22
 511002006.      10643.        20.00       25067.      144.        1.000          1.95         9.92        0.07          0.27
 681001011.       1216.        10.60       10159.       44.        0.614          2.39         8.71        0.07          0.23
 681003012.       1113.         5.60        6575.       57.        0.391          1.69        17.22        0.10          0.36
 681007005.      14379.       144.08       40779.      222.        0.974          1.42        11.39        0.06          0.18
 681007011.      14373.        73.05       40742.       56.        1.000          1.42         2.75        0.01          0.04
 681007006.      13932.       104.21       37834.      252.        0.342          1.55        13.31        0.07          0.23
 681007014.      13936.        80.44       37834.       44.        1.000          1.55         2.94        0.02          0.05
```

```
*************************************************************************************************************

                         VEHICLE - CREW DETAILED REPORT        November 1970

*************************************************************************************************************

CONTROL NO.                              VEHICLE CHARACTERISTICS                                    CREW CHARACTERISTICS
                 TYPE         SIZE     AGE  LIFE EXP    COST    MAINT C/OP HR  CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

 511002201.   REAR LOADER  16.CU YDS    4.      5.     18000.       2.330          0.598         6.     4.06        40.0
 511002202.   REAR LOADER  16.CU YDS    4.      5.   [illegible]    2.440          0.488         6.     4.06        40.0
 511004303.   REAR LOADER  25.CU YDS    1.      5.   [illegible]    0.260          0.471         3.     3.33         8.0
 511004304.   REAR LOADER  25.CU YDS    1.      3.   [illegible]    1.260          0.200         3.     3.00        40.0
 681001211.   SIDE LOADER  20.CU YDS    4.     10.      7465.       0.123          0.236         2.     2.54        16.0
 681003312.   SIDE LOADER  16.CU YDS    3.     10.      8170.       0.300          0.447         3.     1.95        16.8
 681007205.         TRAIN  16.CU YDS    4.      4.     17560.       2.620          1.147        11.     1.97        32.0
 681007213.  FRONT LOADER  24.CU YDS    4.      9.   [illegible]    0.040          1.110         1.     2.42        32.0
 681007206.         TRAIN  16.CU YDS    4.      4.   [illegible]    4.420          1.199        12.     2.09        32.0
 681007214.  FRONT LOADER  24.CU YDS    4.      9.   [illegible]    0.0            0.995         1.     2.64        32.0
```

```
*************************************************************************************************************

                         ROUTE DETAILED REPORT        November 1970

*************************************************************************************************************

CONTROL NO.                          ROUTE CHARACTERISTICS
              LENGTH/DAY  TYPE SERV  DISCG PT  SCHEDULE  AREA SVD  SEPR RECP  AVG WEIGHT/DAY

 511002201.       4.        YARD     INCINRATR   1./WK     0.220      NO         11021.
 511002202.       7.        YARD     INCINRATR   1./WK     0.260      NO         16898.
 511004303.  [illegible]    CURB     LND FILL    1./WK     0.403      YES        23204.
 511002204.       6.        CURB     LND FILL    1./WK     2.450      NO         23794.
 681001211.      11.        CURB     LND FILL    2./WK     0.574      NO          9213.
 681003012.       6.        ALLY     LND FILL    2./WK     0.200      YES         6240.
 681007205.      71.        ALLY     XFER STA    2./WK     3.130      NO         40231.
 681007213.      62.        ALLY     LND FILL    2./WK     3.123      NO         40231.
 681007206.      62.        ALLY     XFER STA    2./WK     1.629      NO         36660.
 681007214.      62.        ALLY     LND FILL    2./WK     1.629      NO         36660.
```

Reproduced from
best available copy.

```
**********************************************************************************************************************

                              OPERATIONS DETAILED REPORT        November 1970

**********************************************************************************************************************

CONTROL      DRIVE TO START OF ROUTE     COLLECTION           TRANSPORTATION      TIME COL/    QTY GEN/    QTY GEN/
               DISTANCE     TIME      DISTANCE     TIME     DISTANCE     TIME     RESID SVC   RESID/DAY  PERSON/DAY

 511002001.      3.47      10.27        6.60     105.07      20.07      84.07       0.25        3.68        1.34
 511002002.      2.33      20.00        6.91     204.52       5.98      67.76       0.98       11.55        2.37
 511002003.      2.00      10.00        6.00     237.50      44.50     170.00       0.58        8.03        1.88
 511002004.     21.00      60.00        4.00     306.20      63.00     206.20       0.57        7.66        1.53
 681001011.      1.00       4.17       10.60     243.50       5.48      35.67       0.55        6.18        1.93
 681003012.      1.33      10.83        8.00     319.83      12.00     101.67       0.98        5.61        1.60
 681007005.     20.35      30.00       65.52     412.67       0.0        0.0        0.16        4.58        1.42
 681007013.      5.63      30.00        0.0        0.0       41.73     480.00       0.0         4.58        1.42
 681007006.      2.00      15.00       53.38     445.31       0.0        0.0        0.20        4.75        1.47
 681007014.      5.40      33.00        0.0        0.0       42.30     480.00       0.0         4.75        1.47
```

```
**********************************************************************************************************************

                              COST BREAKDOWN DETAILED REPORT        November 1970

**********************************************************************************************************************

CONTROL      COST TRAV    EQ COST     MP COST  TOT COST   EQ COST TO   MP COST    TOT COST   RATIO PROD               COST/SQ
             TO ROUT/D    COL/DAY    COL/DAY TO COL/DAY   TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME   COST/DAY  MILE/WEEK

 511002001.      5.35       9.10       42.65     51.74       7.28       34.13      41.41      0.463        212.16    4821.74
 511002002.      3.43      17.38       63.04    100.43       7.56       35.43      43.00      0.632        221.42    3914.45
 511002003.      2.20      14.82       35.54     50.36      10.53       27.71      38.00      0.902        105.54     219.11
 511002004.     16.54      30.27       45.50     75.17      20.30       30.70      51.00      1.000        142.19     290.17
 681001011.      0.43       2.06       21.96     24.03       0.42        3.02       3.44      0.632         44.07     152.24
 681003012.      1.26       5.90       30.31     36.21       1.93        9.91      11.84      0.862         57.18     571.81
 681007005.     13.73      35.74      145.04    183.79       0.0         0.0        0.0       0.938        215.59     275.32
 681007013.      3.33       0.0         0.0       0.0       30.26       13.37      43.63      1.000         53.51      48.21
 681007006.      7.05      40.84      156.16    236.00       0.0         0.0        0.0       0.967        252.18     619.54
 681007014.      3.39       0.0         0.0       0.0       21.66       21.15      42.81      1.000         46.20     113.49
```

```
*************************************************
      POPULATION CHARACTERISTICS     November 1970
*************************************************
CONTROL NO.     ECON LV  RES SVD  PROP SVD

 511002001.          2.    2141.     5855.
 511002002.          4.    1045.     5087.
 511003003.          8.     410.     1751.
 511004004.          7.    2665.    10640.
 681001011.         99.     390.     1216.
 681003012.          5.     218.     1113.
 681007005.          7.    5024.    16234.
 681007013.          7.    5024.    16234.
 681007006.          7.    4412.    14250.
 681007014.          7.    4412.    14250.
```

```
**************************************************************************************************************
                                        SUMMARY REPORT      November 1970
**************************************************************************************************************
CONTROL      PEOPLE S/WK  LBS OF POLT  WEIGHT/DAY  COST/DAY  RATIO PROP/PP  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK
 511002001.       5855.        18.00      11021.       212.          0.463         1.34     38.50          0.18          0.50
 511002002.       5087.        34.05      16858.       221.          0.692         2.37     26.21          0.22          1.06
 511003003.       1751.         6.00      23264.       106.          0.902         1.88      9.13          0.06          0.26
 511004004.      13640.        20.00      28764.       142.          1.000         1.93      9.99          0.07          0.26
 681001011.       1216.        12.00       9213.        44.          0.632         1.93     10.73          0.07          0.23
 681003012.       1113.         5.60       6240.        57.          0.862         1.60     18.33          0.10          0.36
 681007005.      16234.       142.27      40231.       216.          0.938         1.42     10.74          0.05          0.17
 681007013.      16234.        83.47      40231.        54.          1.000         1.42      2.66          0.01          0.04
 681007006.      14250.       104.77      36660.       252.          0.967         1.47     13.76          0.07          0.23
 681007014.      14250.        85.14      36660.        46.          1.000         1.47      2.52          0.01          0.04
```

```
*************************************************************************************************************************

                             VEHICLE - CREW DETAILED REPORT        October 1970

*************************************************************************************************************************

CONTROL NO.                                     VEHICLE CHARACTERISTICS                                 CREW CHARACTERISTICS
               TYPE          SIZE       AGE  LIFE EXP    COST    MAINT C/OP HR   CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

 511002101.   REAR LOADER  20.CU YDS    4.      5.      13000.        2.890            0.641        6.      4.06       40.0
 511002301.   REAR LOADER  16.CU YDS    4.      5.      13000.        2.[illegible]            0.463        6.      4.06       40.0
 51100[illegible].   REAR LOADER  26.CU YDS    1.      5.      24000.        0.260            0.497        3.      3.33        8.0
 681007[illegible].         TRAIN  16.CU YDS    4.      4.      17500.        0.0              1.357       12.      2.00       32.0
 681007014.   FRONT LOADER 26.CU YDS    4.      8.      28500.        0.0              1.279        1.      2.53       32.0


*************************************************************************************************************************

                                  ROUTE DETAILED REPORT        October 1970

*************************************************************************************************************************

CONTROL NO.                                ROUTE CHARACTERISTICS
               LENGTH/DAY   TYPE SERV  DISCG PT   SCHEDULE   AREA SVD   SEPR PROC   AVG WEIGHT/DAY

 511002001.       4.          YARD     INCNRATR    1./WK      0.229        NO           14036.
 5110[illegible].       7.          YARD     INCNRATR    1./WK      0.279        NO           17015.
 5110[illegible].       6.          CURB     LND FILL    1./WK      0.441        YES          23474.
 6810[illegible].      [illegible].          ALLY     XFER STA    2./WK      1.579        NO           36431.
 681007014.      37.          ALLY     LND FILL    2./WK      1.579        NO           36431.
```

```
************************************************************************************************************************

                               OPERATIONS DETAILED REPORT       October 1970

************************************************************************************************************************

CONTROL      DIST TO START OF ROUTE     COLLECTION          TRANSPORTATION       TIME COL/    QTY GEN/     QTY GEN/
                DISTANCE     TIME     DISTANCE     TIME    DISTANCE     TIME     RESID SVC   RESID/DAY   PERSON/DAY

 511002001.        3.63      11.80       6.50     124.90     21.40      88.10       0.29        4.68         1.71
 511002002.        2.36      22.50       6.56     226.00      5.18     116.10       0.97       11.36         2.33
 511005004.        1.80      15.00       6.00     237.61     40.00     150.00       0.65        0.19         2.14
 681007016.        6.76      14.30      63.20     413.00      0.0        0.0        0.19        4.54         1.41
 681007014.        5.43      28.00       0.0        0.0      37.07     480.00       0.0         4.54         1.41
```

```
************************************************************************************************************************

                                 COST BREAKDOWN DETAILED REPORT     October 1970

************************************************************************************************************************

CONTROL        COST TRAV   EQ COST     MP COST  TOT COST  EQ COST TO    MP COST    TOT COST   RATIO PROD                COST/SQ
               TO ROUT/D   COL/DAY     COL/DAY TO COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA   TO PAID TIME   COST/DAY  MILE/WEEK

 511002001.        6.82      10.73      50.71     61.44       7.71       35.77      43.48       0.517        214.56    4876.25
 511002102.       11.94      17.50      84.00    101.50       9.82       47.14      56.95       0.756        224.10    4020.55
 511006003.        3.20      14.90      39.54     54.44       9.41       24.97      34.38       0.369        104.86     243.29
 681007001.        6.47      23.70     163.73    187.43       0.0         0.0        0.0        0.958        216.24     547.93
 681007014.        3.36       0.0        0.0       0.0       23.93       18.25      42.19       1.000         45.52     115.34
```

```
*****************************************************

      POPULATION CHARACTERISTICS      October 1970

*****************************************************

CONTROL NO.     ECON LV  RES SVD  PER SVD

 511002001.         2.    2141.     5564.
 511002002.         4.    1270.     5214.
 511005003.         3.     375.     1570.
 681007306.         7.    4553.    14904.
 681007316.         7.    4553.    14504.
```

```
**********************************************************************************************************

                         SUMMARY REPORT      October 1970

**********************************************************************************************************

CONTROL       PEOPLE S/W  LBS OF POLT  WEIGHT/DAY  COST/DAY  RATIO PROD/PD  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 511002001.      5954.       21.00       14036.      215.        0.517         1.71        30.57        0.18          0.50
 511002002.      5214.       34.80       17515.      224.        0.766         2.33        26.34        0.21          1.05
 511005003.      1570.        6.00       23474.      105.        0.866         2.14         8.93        0.07          0.29
 681007306.     14934.      104.55       36431.      216.        0.828         1.41        11.87        0.06          0.19
 681007316.     14334.       74.27       36431.       46.        1.000         1.41         2.50        0.01          0.04
```

```
***************************************************************************************************************

                          VEHICLE - CREW DETAILED REPORT      March 20 thru March 30, 1971

***************************************************************************************************************

CONTROL NO.                                VEHICLE CHARACTERISTICS                                  CREW CHARACTERISTICS
                TYPE          SIZE      AGE  LIFE EXP    COST   MAINT C/OP HR   CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

 478006008.   SIDE LOADER   20.CU YDS    4.     3.       8500.       0.960           0.500          3.     2.54        16.0
 478006009.  FRONT LOADER   25.CU YDS    1.    10.      22000.       0.660           0.666          4.     2.57        50.0
 478006010.  FRONT LOADER   25.CU YDS    2.    10.      23000.       1.500           0.538          4.     2.54        50.0
 511002001.   REAR LOADER   16.CU YDS    4.     5.      18000.       2.900           0.601          4.     4.10        40.0
 511002002.   REAR LOADER   16.CU YDS    4.     5.      18000.       2.880           0.635          4.     4.10        40.0
 511005003.   REAR LOADER   25.CU YDS    1.     5.      24000.       0.960           0.429          3.     3.33         8.0
 681001011.   SIDE LOADER   20.CU YDS    5.    10.       7465.       0.120           0.253          2.     2.54        16.0
 681003012.   SIDE LOADER   20.CU YDS    6.    10.       8170.       0.300           0.374          3.     1.95        16.8
 681007005.         TRAIN   18.CU YDS    5.     4.      17560.       3.000           1.313         11.     2.13        32.0
 681007013.  FRONT LOADER   26.CU YDS    5.     8.      24500.       0.960           1.637          0.     2.55        32.0
 681007006.         TRAIN   18.CU YDS    5.     4.      17560.       3.420           1.008         12.     2.14        32.0
 681007014.  FRONT LOADER   26.CU YDS    5.    10.      29500.       0.960           1.189          1.     2.68        32.0


***************************************************************************************************************

                          ROUTE DETAILED REPORT      March 20 thru March 30, 1971

***************************************************************************************************************

CONTROL NO.                              ROUTE CHARACTERISTICS
               LENGTH/DAY  TYPE SERV  DISCG PT  SCHEDULE  AREA SVD  SEPR RECD  AVG WEIGHT/DAY

 478006008.       23.        YARD     LND FILL   2./WK     0.936      YES         11052.
 478006009.        9.        YARD     INCNRATR   3./WK     1.245      YES         15287.
 478006010.       11.        YARD     INCNRATR   3./WK     0.703      YES         17470.
 511002001.        7.        YARD     INCNRATR   1./WK     0.217      NO          13572.
 511002002.        5.        YARD     LND FILL   1./WK     0.261      NO          22456.
 511005003.        6.        CURB     LND FILL   1./WK     0.431      NO          22600.
 681001011.       11.        CURB     LND FILL   2./WK     0.579      NO          10773.
 681003012.        6.        ALLY     LND FILL   2./WK     0.200      NO           8530.
 681007005.       71.        ALLY     XFER STA   2./WK     3.250      NO          56138.
 681007013.       39.        ALLY     LND FILL   2./WK     3.250      NO          56138.
 681007006.       55.        ALLY     XFER STA   2./WK     1.737      NO          42361.
 681007014.       40.        ALLY     LND FILL   2./WK     1.737      NO          42364.
```

```
**************************************************************************************************

                              OPERATIONS DETAILED REPORT      March 20 thru March 30, 1971

**************************************************************************************************

CONTROL      DIST TO START OF ROUTE    COLLECTION           TRANSPORTATION      TIME COL/   QTY GEN/    QTY GEN/
               DISTANCE     TIME     DISTANCE    TIME     DISTANCE    TIME     RESID SVC   RESID/DAY  PERSON/DAY

 478006003.      4.20       12.50     23.47     456.33     23.83     102.00      0.09        0.65        0.24
 478006010.      2.67       15.00      8.83     416.33      4.63     138.67      0.97       15.27        5.11
 478006013.      1.75        8.75     16.75     345.63     21.63     113.75      0.76       16.52        5.52
 511002001.      3.30       12.50      3.75     117.50     15.45      85.75      0.27        4.49        1.64
 511002002.      3.11       22.00      4.67     253.25     50.01     191.63      1.14       14.42        2.94
 511005003.      2.00       10.00     13.00     275.00     40.00     165.00      0.75        8.85        2.06
 681001011.      0.87        5.00      8.07     318.33      7.57      36.67      0.84        8.10        2.53
 681003012.      2.30       13.33      7.33     357.33     11.53     114.33      1.12        7.66        2.19
 681007005.     30.00       26.25     71.45     475.17      0.0        0.0       0.19        6.39        1.58
 681007013.      5.40       21.50      0.0        0.0      41.85     480.00      0.0         6.39        1.58
 681007006.      6.95       27.42     54.50     425.67      0.0        0.0       0.19        5.43        1.68
 681007014.      5.40       28.00      0.0        0.0      40.25     480.00      0.0         5.43        1.68
```

```
**************************************************************************************************

                              COST BREAKDOWN DETAILED REPORT      March 20 thru March 30, 1971

**************************************************************************************************

CONTROL      COST TRAV   IO COST    MP COST   TOT COST   FC COST TO   MP COST    TOT COST   RATIO PROD                  COST/SQ
             TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME   COST/DAY   MILE/WEEK

 478006003.     2.18      21.46      57.55     75.42        4.80       12.95      17.75       1.000         55.25      212.16
 478006003.     2.18      16.88      71.33     88.21        5.62       23.76      29.38       0.559        125.50      505.53
 478006013.     1.34      17.11      59.53     76.64        5.96       19.26      25.22       0.823        126.13      856.93
 511002001.     4.33      12.21      26.14     38.34        7.45       20.53      27.98       0.527        133.68     3082.01
 511002002.     7.37      22.14      62.75     84.89       16.75       47.48      64.23       0.980        155.75     3057.44
 511005003.     2.28      16.94      45.75     62.73       10.17       27.47      37.64       0.954        107.65      249.76
 681001011.     0.46       3.88      26.55     30.94        0.45        3.10       3.55       0.774         45.03      155.56
 681003012.     1.54       6.56      34.64     41.20        2.02       11.05      13.07       0.966         57.75      577.48
 681007005.    12.07      50.87     185.55    236.42        0.0         0.0        0.0        1.000        248.49      305.83
 681007013.     1.54       0.0        0.0       0.0        34.48        0.0       34.48       1.000         36.02       44.34
 681007006.    14.65      46.83     183.61    230.44        0.0         0.0        0.0        0.961        254.92      587.05
 681007014.     3.16       0.0        0.0       0.0        18.56       21.41      39.97       1.000         43.14       99.34
```

```
**************************************************

        POPULATION CHARACTERISTICS        March 20 thru March 30, 1971

**************************************************

CONTROL NO.    ECON LV  RES SVD  PROP SVD

 478006008.       0.     4650.    13055.
 478006009.      99.      715.     2139.
 478006010.       1.      755.     2258.
 511002001.       2.     2155.     5912.
 511002002.       2.     1113.     5452.
 511005003.       8.      365.     1570.
 681001011.      99.      380.     1216.
 681003012.       5.      318.     1113.
 681007005.       7.     5024.    14234.
 681007013.       7.     5024.    14234.
 681007006.       7.     4460.    14380.
 681007014.       7.     4460.    14380.
```

```
****************************************************************************************************

                                        SUMMARY REPORT     March 20 thru March 30, 1971

****************************************************************************************************

CONTROL         PEOPLE S/WK  LOT OF SOLT  WEIGHT/DAY  COST/DAY  RATIO PROD/PD  QTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478006008.       13055.       23.47       11052.       99.        1.000          0.24        17.98         0.02          0.04
 478006009.        2139.       15.00       15287.      126.        0.959          5.11        16.47         0.29          0.88
 478006010.        2258.       17.71       17470.      126.        0.823          5.57        14.44         0.28          0.84
 511002001.        5912.       15.00       13573.      134.        0.527          1.64        19.70         0.11          0.31
 511002002.        5452.       23.37       22456.      160.        0.980          2.94        14.23         0.15          0.72
 511005003.        1570.        6.00       22600.      108.        0.954          2.06         9.53         0.07          0.29
 681001011.        1216.       10.60       10773.       45.        0.774          2.53         8.36         0.07          0.24
 681003012.        1113.        5.60        8530.       58.        0.966          2.19        13.54         0.10          0.36
 681007005.       14234.      142.50       56138.      249.        1.000          1.98         8.85         0.06          0.20
 681007013.       14234.       79.30       56138.       36.        1.000          1.98         1.28         0.01          0.03
 681007006.       14380.      100.00       42361.      255.        0.961          1.68        12.04         0.07          0.23
 681007014.       14380.       80.57       42364.       43.        1.000          1.68         2.04         0.01          0.04
```

```
*****************************************************************************************************

                              VEHICLE - CREW DETAILED REPORT        March 6 thru March 19, 1971
*****************************************************************************************************

CONTROL NO.                                VEHICLE CHARACTERISTICS
                 TYPE           SIZE        AGE  LIFE EXP    COST   MAINT C/OP HR   CONSU C/OP HR     CREW CHARACTERISTICS
                                                                                                    SIZE  HRLY RATE  WRK HRS/WK
 478006008.   SIDE LOADER   20.CU YDS    4.      3.       4500.        0.960          0.468          3.     2.54        16.0
 478006009.  FRONT LOADER   25.CU YDS    1.     10.      25000.        0.660          0.732          4.     2.57        50.0
 478006010.  FRONT LOADER   25.CU YDS    2.     15.      23000.        1.500          0.570          4.     2.54        50.0
 511002001.   REAR LOADER   16.CU YDS    4.      5.      18000.        2.880          0.749          4.     4.09        40.0
 511002002.   REAR LOADER   16.CU YDS    4.      5.      18000.        2.890          0.593          4.     4.09        40.0
 511005003.   REAR LOADER   25.CU YDS    1.      5.      24000.        0.960          0.480          3.     3.33         8.0
 681001011.   SIDE LOADER   20.CU YDS    5.     10.       7465.        0.120          0.246          2.     2.54        16.0
 681003012.   SIDE LOADER   20.CU YDS    6.     10.       8170.        0.300          0.420          3.     1.95        16.8
 681007005.         TRAIN   18.CU YDS    4.      4.      17560.        3.000          1.282         11.     1.95        32.0
 681007013.  FRONT LOADER   26.CU YDS    5.      8.      24500.        0.960          1.087          0.     2.41        32.0
 681007006.         TRAIN   18.CU YDS    5.      4.      17560.        3.420          1.041         12.     2.03        32.0
 681007014.  FRONT LOADER   26.CU YDS    5.     80.      28500.        0.960          0.881          1.     2.57        32.0


*****************************************************************************************************

                              ROUTE DETAILED REPORT        March 6 thru March 19, 1971
*****************************************************************************************************

CONTROL NO.                              ROUTE CHARACTERISTICS
             LENGTH/DAY  TYPE SERV  DISCG PT  SCHEDULE  AREA SVC  SEPR RECD  AVG WEIGHT/DAY
 478006008.     23.        YARD     LND FILL   2./WK     0.936      YES          10496.
 478006009.     13.        YARD     INCNRATR   3./WK     1.221      YES          22181.
 478006010.     10.        YARD     INCNRATR   3./WK     0.675      YES          16850.
 511002001.      8.        YARD     INCNRATR   1./WK     0.220      NO           15920.
 511002002.      5.        YARD     INCNRATR   1./WK     0.278      NO           22702.
 511005003.      6.        CURB     LND FILL   1./WK     0.431      NO           19925.
 681001011.     11.        CURB     LND FILL   2./WK     0.579      NO           11495.
 681003012.      6.        ALLY     LND FILL   2./WK     0.200      NO            8075.
 681007005.     70.        ALLY     XFER STA   2./WK     3.083      NO           47892.
 681007013.     39.        ALLY     LND FILL   2./WK     3.083      NO           45737.
 681007006.     55.        ALLY     XFER STA   2./WK     1.737      NO           35553.
 681007014.     38.        ALLY     LND FILL   2./WK     1.737      NO           42653.
```

```
***************************************************************************************************************

                                        OPERATIONS DETAILED REPORT        March 6 thru March 19, 1971

***************************************************************************************************************

CONTROL        FCCL TO START OF ROUTE      COLLECTION             TRANSPORTATION        TIME COL/    QTY GEN/    QTY GEN/
                 DISTANCE     TIME      DISTANCE      TIME      DISTANCE      TIME      RESID SVC   RESID/DAY  PERSON/DAY

 478006008.        4.20       15.00       23.30      466.88       19.50       78.75       0.10        0.61        0.23
 478016009.        2.40       33.50        6.20      377.40        3.74      177.60       0.87       21.85        8.76
 478006010.        2.00       10.00       14.40      340.00       20.40       92.00       0.78       16.60        5.55
 511002001.        2.70       14.50        2.50      128.50       25.20       99.00       0.30        5.31        1.54
 511002002.        2.22       28.60        4.70      276.50       37.28      185.20       1.29       15.15        3.11
 511005003.        2.00       13.00       14.00      237.00       41.00      175.00       0.55        6.66        1.55
 681001011.        0.35        5.00        8.65      303.75        6.77       46.25       0.80        8.64        2.70
 681002012.        2.00       11.25        8.00      315.00        9.45      105.00       0.99        7.26        2.07
 681007005.       30.00       24.29       70.44      393.71        0.0         0.0        0.16        5.54        1.71
 681007013.        5.40       21.71        0.0         0.0        43.63      480.00       0.0         5.29        1.64
 681007006.        6.95       26.50       54.50      432.00        0.0         0.0        0.19        4.56        1.41
 681007014.        5.40       38.00        0.0         0.0        38.17      480.00       0.0         5.46        1.69


***************************************************************************************************************

                                        COST BREAKDOWN DETAILED REPORT        March 6 thru March 19, 1971

***************************************************************************************************************

CONTROL        COST TRAV    EQ COST      MP COST    TOT COST   EQ COST TO    MP COST     TOT COST   RATIO PROD                COST/SQ
               TO ROUT/D    COL/DAY      COL/DAY  TO COL/DAY   TRANSP/DA    TRANSP/DA   TRANSP/DA  TO PAID TIME   COST/DAY   MILE/WEEK

 478006008.       2.60       21.71        55.25      91.01        3.66        10.00       13.66       1.000        97.27      207.74
 478016009.       2.40       15.71        64.66      90.37        5.31        21.86       27.17       0.888       124.39      509.39
 478006010.       2.22       15.00        57.57      75.57        4.87        15.58       20.45       0.786       125.00      925.90
 511002001.       5.87       11.40        35.04      46.51        8.84        26.90       35.84       0.579       152.67     3469.78
 511002002.      10.28       24.01        75.50      99.51       16.06        50.50       66.56       1.000       176.35     3171.80
 511005003.       2.00       14.80        35.46      54.26       10.93        29.14       40.07       0.914       106.47      247.02
 681001011.       0.48        3.67        25.72      29.39        0.56         3.92        4.47       0.764        44.93      155.19
 681002012.       1.31        5.84        30.71      36.55        1.95        10.24       12.19       0.876        57.14      571.39
 681007005.      11.44       41.66       143.54     195.45        0.0          0.0         0.0        0.957       215.53      284.84
 681007013.       1.36        0.0          0.0        0.0        30.08         0.0        30.08       1.000        31.44       40.79
 681007006.      13.65       47.32       175.18     222.49        0.0          0.0         0.0        0.964       244.86      563.87
 681007014.       2.90        0.0          0.0        0.0        16.10        20.56       36.66       1.000        39.56       91.11
```

```
*****************************************************

        POPULATION CHARACTERISTICS      March 6 thru March 19, 1971

*****************************************************

CONTROL NO.      COMPLEX   RES SVD   PEOP SVD

 478006008.          0.     4850.     13055.
 478006009.         69.      725.      1809.
 478006011.          1.      725.      2165.
 511002001.          2.     2141.      5865.
 511002002.          2.     1930.      5214.
 511005003.          8.      428.      1835.
 681001011.         33.      380.      1216.
 681003012.          5.      318.      1113.
 681007005.          7.     4541.     15965.
 681007012.          7.     4541.     15965.
 681007006.          7.     4460.     14380.
 681007014.          7.     4460.     14380.
```

```
******************************************************************************************************

                              SUMMARY REPORT      March 6 thru March 19, 1971

******************************************************************************************************

CONTROL        PEOPLE S/WK  LGT OF ROUT   WEIGHT/DAY   COST/DAY  RATIO PROD/PC  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478006008.       13055.        23.30        10456.        97.        1.000          0.23       18.53        0.01          0.04
 478006009.        1809.        17.33        22181.       124.        0.888          8.76       11.22        0.34          0.86
 478006011.        2168.        17.00        16850.       125.        0.786          5.55       14.84        0.29          0.86
 511002001.        5865.        14.00        15920.       153.        0.579          1.94       19.18        0.13          0.36
 511002002.        5214.        23.50        22702.       176.        1.000          3.11       15.54        0.17          0.82
 511005003.        1839.         6.00        19525.       106.        0.914          1.55       10.69        0.06          0.25
 681001011.        1216.        10.60        11455.        45.        0.764          2.70        7.82        0.07          0.24
 681003012.        1113.         5.60         6075.        57.        0.876          2.07       14.15        0.10          0.36
 681007005.       15965.       140.85        47552.       220.        0.897          1.71        9.17        0.06          0.18
 681007012.       15965.        77.57        45747.        41.        1.000          1.64        1.37        0.01          0.03
 681007006.       14383.       109.00        35553.       245.        0.964          1.41       13.77        0.07          0.22
 681007014.       14380.        76.45        42653.        49.        1.000          1.69        1.86        0.01          0.04
```

```
*********************************************************************************************

                         VEHICLE - CREW DETAILED REPORT      February 20 thru March 5, 1971

*********************************************************************************************

CONTROL NO.                                  VEHICLE CHARACTERISTICS                                  CREW CHARACTERISTICS
               TYPE          SIZE     AGE  LIFE EXP   COST   MAINT C/OP HR  CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

478004007.   REAR LOADER  25.CU YDS   3.     5.     18000.       0.180          0.283         4.     2.50        32.0
478006003.   SIDE LOADER  20.CU YDS   4.     3.      4500.       0.960          0.480         3.     2.54        16.0
511002001.   REAR LOADER  16.CU YDS   4.     5.     18000.       2.880          0.780         4.     4.05        40.0
511002002.   REAR LOADER  16.CU YDS   4.     5.     18000.       2.880          0.463         4.     4.05        40.0
511005003.   REAR LOADER  25.CU YDS   1.     5.     24000.       0.960          0.481         3.     3.33         8.0
681001011.   SIDE LOADER  20.CU YDS   5.    10.      7465.       0.120          0.273         2.     2.54        16.0
681003012.   SIDE LOADER  20.CU YDS   6.    10.      8170.       0.300          0.437         3.     1.95        16.8
681007005.         TRAIN  18.CU YDS   5.     4.     17560.       3.000          1.161        11.     2.03        32.0
681007013.  FRONT LOADER  26.CU YDS   5.     8.     28500.       0.960          1.206         0.     2.45        32.0
681007006.         TRAIN  18.CU YDS   5.     4.     17560.       3.420          0.994        12.     2.07        32.0
681007014.  FRONT LOADER  26.CU YDS   5.    80.     28500.       0.960          0.816         1.     2.57        32.0


*********************************************************************************************

                              ROUTE DETAILED REPORT      February 20 thru March 5, 1971

*********************************************************************************************

CONTROL NO.                          ROUTE CHARACTERISTICS
             LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVD  SEPR RECD  AVG WEIGHT/DAY

478004007.      14.        YARD     LND FILL    2./WK     0.724       YES          5357.
478006003.      25.        YARD     LND FILL    2./WK     0.936       YES         11611.
511002001.       4.        YARD     INCNRATR    1./WK     0.220       NO          17744.
511002002.       5.        YARD     INCNRATR    1./WK     0.278       NO          19931.
511005003.       6.        CURB     LND FILL    1./WK     0.431       NO          22100.
681001011.      11.        CURB     LND FILL    2./WK     0.579       NO          10410.
681003012.       6.        ALLY     LND FILL    2./WK     0.200       NO           7965.
681007005.      71.        ALLY     XFER STA    2./WK     3.250       NO          47262.
681007013.      33.        ALLY     LND FILL    2./WK     3.250       NO          46763.
681007006.      65.        ALLY     XFER STA    2./WK     1.737       NO          35735.
681007014.      38.        ALLY     LND FILL    2./WK     1.737       NO          36110.
```

```
*****************************************************************************************************

                     OPERATIONS DETAILED REPORT     February 20 thru March 5, 1971

*****************************************************************************************************

CONTROL      POOL TO START OF ROUTE      COLLECTION          TRANSPORTATION      TIME COL/   QTY GEN/    QTY GEN/
              DISTANCE     TIME      DISTANCE     TIME     DISTANCE     TIME     RESID SVC   RESID/DAY   PERSON/DAY

 478004007.      0.0        0.0        1.57      274.33      2.92       82.50      0.54        2.99        0.52
 478006004.      4.20      15.00      24.53      460.00     19.50       96.89      0.29        2.09        0.78
 511002001.      4.20      16.50       3.80      166.20     25.00       97.30      0.39        5.92        2.16
 511002002.      2.22      21.50       4.70      304.50     11.38      131.50      1.42       13.24        2.72
 511005004.      2.00      12.50      14.50      262.50     41.00      160.00      0.55        6.58        1.53
 681001011.      0.39       5.00       8.37      270.00      5.85       36.25      0.71        7.83        2.45
 681003012.      1.75      11.25       7.25      308.75      9.45       95.00      0.97        7.16        2.04
 681007005.     20.30      24.50      71.45      423.25      0.0         0.0       0.17        5.38        1.66
 681007013.      5.40      24.50       0.0         0.0      41.95      480.00      0.0         5.32        1.65
 681007006.      6.95      26.50      54.50      409.25      0.0         0.0       0.18        4.58        1.42
 681007014.      5.40      38.00       0.0         0.0      38.17      480.00      0.0         4.63        1.42


*****************************************************************************************************

                     COST BREAKDOWN DETAILED REPORT     February 20 thru March 5, 1971

*****************************************************************************************************

CONTROL      COST TRAV   EQ COST    MP COST   TOT COST   EQ COST TO   MP COST    TOT COST   RATIO PROD                COST/SQ
             TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME   COST/DAY  MILE/WEEK

 478004007.     0.0       10.03      45.72      55.75       3.02       13.75      16.77       0.779        93.05      514.08
 478006008.     2.61      21.49      58.42      79.90       4.06       11.03      15.09       1.000        97.60      209.43
 511002011.     6.08      14.93      45.32      60.25       8.74       26.53      35.27       0.651       156.04     3546.29
 511002012.     7.69      25.76      83.03     108.77      11.12       35.86      46.97       0.944       169.57     3049.73
 511005003.     2.96      16.40      43.71      60.11      10.00       26.64      36.64       0.930       107.10      248.49
 681001011.     0.49       3.38      22.86      26.24       0.45        3.07       3.52       0.679        44.54      153.85
 681003012.     1.31       5.81      30.10      35.91       1.79        9.26      11.05       0.848        56.55      569.52
 681007005.    11.67      44.24     157.13     201.37       0.0         0.0        0.0        0.947       225.00      276.53
 681007014.     1.59       0.0        0.0        0.0       31.03        0.0       31.03       1.000        32.62       40.14
 681007015.    13.95      44.40     165.02     213.41       0.0         0.0        0.0        0.924       246.00      566.49
 681007014.     2.96       0.0        0.0        0.0       15.58       20.56      36.14       1.000        39.00       89.81
```

```
****************************************************

     POPULATION CHARACTERISTICS     February 20 thru March 5, 1971

****************************************************

CONTROL NO.    ECON LV  RES SVD  PEOP SVD

 478004007.       9.     1023.     3335.
 478006009.       4.     1565.     4243.
 511002001.       2.     2141.     5365.
 511002002.       2.     1070.     5214.
 511005003.       8.      460.     2662.
 681001011.      99.      380.     1216.
 681003012.       5.      318.     1113.
 681007005.       7.     5024.    16234.
 681007013.       7.     5024.    16234.
 681007006.       7.     4460.    14380.
 681007014.       7.     4460.    14380.
```

```
**************************************************************************************************

                                 SUMMARY REPORT     February 20 thru March 5, 1971

**************************************************************************************************

CONTROL        PEOPLE S/WK  PCT OF POLT  WEIGHT/DAY  COST/DAY  RATIO RECD/PD  QTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478004007.       3335.        27.00        5357.       93.        0.779          0.92       34.74        0.11           0.36
 478006009.       4243.        24.53       11611.       98.        1.000          0.78       16.81        0.05           0.12
 511002001.       5365.        14.00       17744.      156.        0.651          2.16       17.59        0.13           0.36
 511002002.       5214.        23.60       19531.      170.        0.964          2.72       17.10        0.16           0.79
 511005003.       2662.         6.00       22100.      107.        0.930          1.53        9.69        0.05           0.22
 681001011.       1216.        10.60       10410.       45.        0.679          2.45        8.56        0.07           0.23
 681003012.       1113.         5.60        7565.       57.        0.848          2.04       14.30        0.10           0.36
 681007005.      16234.       142.90       47262.      225.        0.947          1.66        9.52        0.06           0.18
 681007013.      16234.        75.55       46753.       33.        1.000          1.65        1.39        0.01           0.03
 681007006.      14380.       109.50       35735.      246.        0.924          1.42       13.77        0.07           0.22
 681007014.      14380.        76.45       26110.       39.        1.000          1.43        2.16        0.01           0.03
```

```
**************************************************************************************************************
                              VEHICLE - CREW DETAILED REPORT       February 6 thru February 19, 1971
**************************************************************************************************************
CONTROL NO.
                                                 VEHICLE CHARACTERISTICS                                    CREW CHARACTERISTICS
                TYPE          SIZE       AGE  LIFE EXP    COST    MAINT C/OP HR   CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

 478004007.   REAR LOADER   25.CU YDS    2.      5.      18000.        0.180            0.363        4.      2.50       32.0
 478006008.   SIDE LOADER   20.CU YDS    4.      3.       8500.        0.960            0.457        3.      2.54       16.0
 511002001.   REAR LOADER   16.CU YDS    4.      5.      14000.        2.890            0.917        4.      4.09       40.0
 511002002.   REAR LOADER   16.CU YDS    4.      5.      18000.        2.990            0.458        4.      4.09       40.0
 511005003.   REAR LOADER   25.CU YDS    1.      5.      26000.        0.960            0.497        3.      3.33        8.0
 681001011.   SIDE LOADER   20.CU YDS    4.     10.       7465.        0.120            0.277        2.      2.54       16.0
 681003012.   SIDE LOADER   20.CU YDS    6.     10.       8170.        0.300            0.424        3.      1.55       16.8
 681007005.         TRAIN   18.CU YDS    5.      4.      17560.        3.000            1.459       11.      2.08       32.0
 681007013.  FRONT LOADER   26.CU YDS    5.      8.      24560.        0.960            1.151        0.      2.51       32.0
 681007006.         TRAIN   18.CU YDS    5.      4.      17560.        3.420            1.030       12.      2.16       32.0
 681007014.  FRONT LOADER   26.CU YDS    5.     10.      28500.        0.960            1.428        1.      2.68       32.0


**************************************************************************************************************
                                   ROUTE DETAILED REPORT       February 6 thru February 19, 1971
**************************************************************************************************************
CONTROL NO.
                                         ROUTE CHARACTERISTICS
             LENGTH/DAY   TYPE SERV  DISCG PT   SCHEDULE   AREA SVD  SEPR RECC  AVG WEIGHT/DAY
 478004007.      14.          YARD   LND FILL    2./WK      0.724       YES          4380.
 478006008.      24.          YARD   LND FILL    2./WK      0.936       YES         10170.
 511002001.       3.          YARD   INCNRATR    1./WK      0.233        NC         14243.
 511002002.       8.          YARD   LND FILL    1./WK      0.278        NC         19961.
 511005003.       6.          CURB   LND FILL    1./WK      0.431        NC         18000.
 681001011.      11.          CURB   LND FILL    2./WK      0.579       YES          9905.
 681003012.       6.          ALLY   LND FILL    2./WK      0.200        NC          7510.
 681007005.      79.          ALLY   XFER STA    2./WK      3.016        NC         37383.
 681007013.      41.          ALLY   LND FILL    2./WK      3.016        NC         37380.
 681007006.      55.          ALLY   XFER STA    2./WK      1.781        NC         37280.
 681007014.      41.          ALLY   LND FILL    2./WK      1.781        NC         37285.
```

```
***********************************************************************************************************

                         OPERATIONS DETAILED REPORT      February 6 thru February 19, 1971

***********************************************************************************************************

CONTROL      POOL TO START OF ROUTE     COLLECTION          TRANSPORTATION     TIME COL/   QTY GEN/    QTY GEN/
              DISTANCE      TIME      DISTANCE     TIME    DISTANCE    TIME    RESID SVC  RESID/DAY  PERSON/DAY

 478004007.       0.0        0.0        1.53     251.67      2.90      78.33     0.49        2.45        0.75
 478006009.       4.70      15.00      23.43     438.75     16.75      67.13     0.90        5.54        2.23
 511002001.       3.63      14.88       9.63     151.00     21.50      92.88     0.36        4.81        1.76
 511002002.       2.22      23.00       4.70     283.60     17.54     152.00     1.33       13.33        2.73
 511005003.       2.00      10.00      14.00     732.50     40.50     190.00     0.50        5.48        1.27
 681001011.       1.10       5.00       8.43     275.00      5.20      26.75     0.72        7.45        2.33
 681003012.       1.50      10.00       8.25     320.00      9.45      97.50     1.01        6.75        1.53
 681007005.      20.00      24.20      70.04     355.60      0.0        0.0      0.14        4.35        1.35
 681007013.       5.40      22.80       0.0        0.0      44.34     480.00     0.0         4.35        1.35
 681007006.       7.57      25.67      55.33     454.33      0.0        0.0      0.22        5.12        1.59
 681007014.       5.40      38.00       0.0        0.0      41.30     480.00     0.0         5.12        1.59
```

```
***********************************************************************************************************

                         COST BREAKDOWN DETAILED REPORT      February 6 thru February 19, 1971

***********************************************************************************************************

CONTROL      COST TRAV   EQ COST    MP COST   TOT COST  EQ COST TO   MP COST    TOT COST   RATIO PROD                COST/SQ
             TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME  COST/DAY   MILE/WEEK

 478004007.     0.0        9.54      41.94     51.49       2.97       13.06      16.02       0.730        92.51      511.08
 478006004.     2.60      20.33      55.72     76.05       2.92        8.02      10.94       1.000        89.59      191.32
 511002001.     4.47      13.91      41.17     55.08       7.63       22.60      30.23       0.590       152.80     3298.56
 511002002.    10.36      23.56      77.33    101.29      12.84       41.45      54.29       0.975       170.13     3059.94
 511005003.     2.29      14.59      38.71     53.30      11.92       31.64      43.56       0.926       107.05      248.39
 681001011.     0.49       3.46      23.28     26.75       0.34        2.26       2.60       0.670        44.50      153.72
 681003012.     1.16       5.96      31.20     37.16       1.81        9.51      11.32       0.869        57.10      570.96
 681007005.    11.36      38.94     135.34    174.28       0.0         0.0        0.0        0.830       224.27      297.45
 681007013.     1.45       0.0        0.0       0.0       30.59        0.0       30.59       1.000        32.04       42.50
 681007006.    14.33  [illegible]   155.57    245.65       0.0         0.0        0.0        1.000       255.53      587.99
 681007014.     3.32       0.0        0.0       0.0       20.47       21.41      41.89       1.000        45.20      101.54
```

```
**************************************************

        POPULATION CHARACTERISTICS        February 6 thru February 19, 1971

**************************************************

CONTROL NO.     ECON LV   RES SVD   PEOP SVD

 478004007.         8.     1023.     3335.
 478006008.         4.      489.     1306.
 511002001.         2.     2113.     5786.
 511002002.         2.     1070.     5214.
 511005003.         4.      469.     2017.
 681001011.        99.      380.     1216.
 681003012.         5.      219.     1113.
 681007005.         7.     4507.    15858.
 681007013.         7.     4507.    15858.
 681007006.         7.     4163.    13431.
 681007014.         7.     4163.    13431.
```

```
****************************************************************************************************************

                                   SUMMARY REPORT      February 6 thru February 19, 1971

****************************************************************************************************************

CONTROL       PEOPLE S/WK   PCT OF POLL   WEIGHT/DAY   COST/DAY  RATIO PROP/PD  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478004007.       3335.        27.00         4380.         93.        0.730          0.75       42.24        0.11          0.36
 478006008.       1306.        23.53        10170.         90.        1.000          2.23       17.62        0.14          0.37
 511002001.       5786.        15.63        14243.        134.        0.590          1.76       21.60        0.13          0.36
 511002002.       5214.        23.40        15561.        170.        0.975          2.73       17.05        0.16          0.80
 511005003.       2017.         6.00        19000.        107.        0.926          1.27       11.89        0.05          0.23
 681001011.       1216.        10.60         5505.         45.        0.670          2.23        8.55        0.07          0.23
 681003012.       1113.         5.60         7510.         57.        0.869          1.93       15.21        0.10          0.36
 681007005.      15858.       140.08        37393.        224.        0.830          1.35       12.00        0.06          0.18
 681007013.      15858.        82.24        37310.         32.        1.000          1.35        1.71        0.01          0.03
 681007006.      13431.       110.67        37260.        260.        1.000          1.59       13.92        0.08          0.25
 681007014.      13431.        82.67        37245.         45.        1.000          1.59        2.42        0.01          0.04
```

```
*****************************************************************************************************
                    VEHICLE - CREW DETAILED REPORT     January 23 thru February 5, 1971
*****************************************************************************************************
CONTROL NO.
                                              VEHICLE CHARACTERISTICS                                CREW CHARACTERISTICS
                 TYPE          SIZE       AGE  LIFE EXP   COST   MAINT C/OP HR  CONSU C/OP HR   SIZE  HRLY RATE  WRK HRS/WK
 478004007.  REAR LOADER   25.CU YDS    2.      5.     18000.      0.190          0.306         4.      2.50        32.0
 478006009.  SIDE LOADER   20.CU YDS    4.      3.      8500.      0.260          0.510         3.      2.54        16.0
 511002001.  REAR LOADER   16.CU YDS    4.      5.     18000.      2.880          0.602         4.      4.05        40.0
 511002002.  REAR LOADER   16.CU YDS    4.      5.     18200.      2.880          0.575         4.      4.09        40.0
 511005003.  REAR LOADER   25.CU YDS    1.      5.     24000.      0.960          0.477         3.      3.33         8.0
 511999004.  REAR LOADER   25.CU YDS    2.      3.     23500.      1.260          1.035         3.      3.00        40.0
 681001011.  SIDE LOADER   20.CU YDS    4.     10.      7465.      0.120          0.290         2.      2.54        16.0
 681003012.  SIDE LOADER   15.CU YDS    4.     10.      7704.      0.300          0.447         3.      1.95        16.8
 681007005.        TRAIN   15.CU YDS    6.      4.     17560.      3.000          0.813        11.      2.03        32.0
 681007013.  FRONT LOADER  26.CU YDS    6.      8.     28500.      0.360          0.952         0.      2.45        32.0
 681007006.        TRAIN   16.CU YDS    5.      4.     17560.      3.420          0.991        12.      2.07        32.0
 681007014.  FRONT LOADER  26.CU YDS    5.     60.     28500.      0.960          0.923         1.      2.57        32.0

*****************************************************************************************************
                    ROUTE DETAILED REPORT     January 23 thru February 5, 1971
*****************************************************************************************************
CONTROL NO.
                                          ROUTE CHARACTERISTICS
             LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVD  SEPR RECD  AVG WEIGHT/DAY
 478004007.     14.        YARD     LND FILL    2./WK     0.724      YES          4673.
 478006003.     24.        YARD     LND FILL    2./WK     0.936      YES         11318.
 511002001.      2.        YARD     INCINRATR   1./WK     0.220      NO          12161.
 511002002.      5.        YARD     LND FILL    1./WK     0.274      NO          20273.
 511005003.      6.        CURB     LND FILL    1./WK     0.431      YES         23005.
 511999004.      4.        CURB     LND FILL    1./WK     2.450      NO          28675.
 681001011.     11.        CURB     LND FILL    2./WK     0.579      YES          9950.
 681003012.      5.        ALLY     LND FILL    2./WK     0.200      YES          6880.
 681007005.     71.        ALLY     XFER STA    2./WK     3.250      NO          39868.
 681007013.  [illegible]   ALLY     LND FILL    2./WK     3.250      NO          39865.
 681007006.     55.        ALLY     XFER STA    2./WK     1.737      NO          25181.
 681007014.     39.        ALLY     LND FILL    2./WK     1.737      NO          29638.
```

```
****************************************************************************************************

                         OPERATIONS DETAILED REPORT     January 23 thru February 5, 1971

****************************************************************************************************

CONTROL      REQ TO START OF ROUTE      COLLECTION           TRANSPORTATION      TIME COL/   QTY GEN/    QTY GEN/
               DISTANCE    TIME      DISTANCE    TIME      DISTANCE     TIME      RESID SVC   RESID/DAY  PERSON/DAY

 478004007.      0.0        0.63      15.75     262.50      29.13       88.13       0.51        2.61        0.80
 478006008.      4.70      15.00      23.18     445.63      17.50       76.88       0.91        6.61        2.48
 511002001.      4.50      18.40       2.60     146.50      18.92       83.10       0.34        4.06        1.48
 511002002.      2.22      21.30       4.70     275.50      45.82      180.70       1.29       13.53        2.78
 511005003.      2.00      10.00      13.00     770.00      41.00      147.50       0.74        5.00        2.09
 511999004.     21.00      60.00       4.00     330.00      60.00      190.00       0.61        7.63        1.53
 681001011.      1.00       5.00       8.25     253.75       5.70       33.75       0.67        7.48        2.34
 681003012.      1.75      12.50       0.62     305.00      12.00       87.50       0.96        6.18        1.77
 681007005.     30.00      24.50      71.45     467.17       0.0         0.0        0.19        4.53        1.40
 681007013.      5.40      26.00       0.0        0.0       41.85      480.00       0.0         4.53        1.40
 681007006.      6.95      26.50      54.50     369.88       0.0         0.0        0.17        3.23        1.00
 681007014.      5.40      38.00       0.0        0.0       38.17      480.00       0.0         3.80        1.18
```

```
****************************************************************************************************

                         COST BREAKDOWN DETAILED REPORT     January 23 thru February 5, 1971

****************************************************************************************************

CONTROL        COST TRAV    EQ COST     MP COST   TOT COST   EQ COST TO    MP COST    TOT COST    RATIO PROD                 COST/SQ
               TO ROUT/D    COL/DAY     COL/DAY  TO COL/DAY  TRANSP/DA   TRANSP/DA   TRANSP/DA  TO PAID TIME   COST/DAY   MILE/WEEK

 478004007.      0.13        9.70        43.75     53.45        3.26       14.69       17.94       0.769         92.97     513.67
 478006008.      2.61       21.04        56.59     77.63        3.63        9.76       13.39       1.000         93.64     199.97
 511002001.      0.67       12.72        39.95     52.67        7.22       22.66       29.88       0.585        152.43    3464.27
 511002002.      7.55       23.81        75.12     98.93       15.62       49.27       64.89       0.996        172.15    3096.30
 511005003.      2.29       16.85        44.96     61.81        9.21       24.56       33.76       0.918        106.60     247.34
 511999004.     15.06       33.33        49.50     82.83       19.19       28.50       47.69       1.000        145.59     257.12
 681001011.      0.49        3.25        21.48     24.74        0.43        2.86        3.29       0.642         44.39     153.33
 681003012.      1.45        5.58        29.74     35.32        1.60        8.53       10.13       0.829         56.56     565.55
 681007005.     11.51       46.12       173.44    219.56        0.0         0.0         0.0        1.000        231.07     284.40
 681007013.      1.57        0.0          0.0       0.0        29.00        0.0        29.00       1.000         30.57      37.63
 681007006.     13.85       40.20       153.13    193.33        0.0         0.0         0.0        0.857        241.81     556.83
 681007014.      2.93        0.0          0.0       0.0        16.44       20.56       37.00       1.000         39.92      91.94
```

```
**************************************************

        POPULATION CHARACTERISTICS      January 23 thru February 5, 1971

**************************************************

CONTROL NO.      ECON LV   RES SVD   PROP SVD

 478004007.          8.     1023.      3335.
 478006009.          4.      489.      1306.
 511002001.          2.     2141.      5965.
 511002002.          2.     1070.      5214.
 511005003.          8.      365.      1570.
 511999004.          7.     2685.     10640.
 681001011.         99.      380.      1216.
 681003012.          5.      318.      1113.
 681007005.          7.     5024.     16234.
 681007013.          7.     5024.     16234.
 681007006.          7.     4480.     14380.
 681007014.          7.     4480.     14380.
```

```
****************************************************************************************************************

                        SUMMARY REPORT    January 23 thru February 5, 1971

****************************************************************************************************************

CONTROL        PEOPLE S/WK  PCT OF POLL   WEIGHT/DAY   COST/DAY  RATIO PROP/PP  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478004007.        3335.        27.00        4673.        93.         0.769         0.80      39.80         0.11          0.36
 478006009.        1306.        23.18       11318.        94.         1.000         2.48      16.55         0.14          0.38
 511002001.        5965.        11.50       12161.       152.         0.585         1.48      25.07         0.13          0.36
 511002002.        5214.        23.50       20273.       172.         0.996         2.78      16.98         0.17          0.80
 511005003.        1570.         6.00       23005.       107.         0.918         2.09       9.27         0.07          0.29
 511999004.       10640.        20.00       28675.       146.         1.000         1.93      10.15         0.07          0.27
 681001011.        1216.        10.40        9550.        44.         0.642         2.34       8.92         0.07          0.23
 681003012.        1113.         5.60        6880.        57.         0.829         1.77      16.44         0.10          0.36
 681007005.       16234.       142.50       39869.       231.         1.000         1.40      11.59         0.06          0.18
 681007013.       16234.        78.20       39695.        31.         1.000         1.40       1.53         0.01          0.02
 681007006.       14380.       109.00       25181.       242.         0.957         1.06      19.21         0.07          0.22
 681007014.       14380.        76.45       29638.        40.         1.000         1.18       2.69         0.01          0.04
```

```
*****************************************************************************************************

                    VEHICLE - CREW DETAILED REPORT      December 26, 1970 thru
                                                        January 8, 1971
*****************************************************************************************************

CONTROL NO.                          VEHICLE CHARACTERISTICS                                       CREW CHARACTERISTICS
               TYPE         SIZE      AGE  LIFE EXP    COST   MAINT C/OP HR   CONSU C/OP HR   SIZE  HRLY RATE  WRK HRS/WK

 479006238.  SIDE LOADER  20.CU YDS   3.      3.       8500.       0.960           0.436       3.      2.54        16.0
 511002001.  REAR LOADER  16.CU YDS   4.      5.      19000.       2.930           0.641       6.      4.06        40.0
 511002002.  REAR LOADER  16.CU YDS   4.      5.      18000.       2.380           0.665       6.      4.06        40.0
 511005003.  REAR LOADER  25.CU YDS   1.      5.      24000.       0.960           0.444       3.      3.33         8.0
 511999004.  REAR LOADER  25.CU YDS   1.      3.      23500.       1.260           0.940       3.      3.00        40.0
 681001011.  SIDE LOADER  20.CU YDS   4.     10.       7465.       0.120           0.268       2.      2.54        16.0
 681003012.  SIDE LOADER  16.CU YDS   3.     10.       8170.       0.300           0.485       3.      1.95        16.8
 681007005.        TRAIN  18.CU YDS   4.      4.      17560.       3.420           1.300      11.      2.18        32.0
 681007013.  FRONT LOADER 26.CU YDS   4.      6.      28500.       0.960           1.000       1.      2.68        32.0
 681007006.        TRAIN  18.CU YDS   4.      4.      17560.       3.420           1.257      12.      2.03        32.0
 681007014.  FRONT LOADER 26.CU YDS   4.      8.      28500.       0.960           0.534       1.      2.57        32.0

*****************************************************************************************************

                    ROUTE DETAILED REPORT               December 26, 1970 thru
                                                        January 8, 1971
*****************************************************************************************************

CONTROL NO.                          ROUTE CHARACTERISTICS
             LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVC  SEPR REQD  AVG WEIGHT/DAY

 479006009.     24.        YARD     LND FILL    2./WK     0.925      YES         12660.
 511002001.      4.        YARD     INCNRATR    1./WK     0.209      NO          15510.
 511002002.      5.        YARD     INCNRATR    1./WK     0.292      NO          20667.
 511005003.      6.        CURB     LND FILL    1./WK     0.492      YES         24270.
 511999004.      4.        CURB     LND FILL    1./WK     2.450      NO          28373.
 681001011.     11.        CURB     LND FILL    2./WK     0.579      YES          9895.
 681003012.      6.        ALLY     LND FILL    2./WK     0.200      YES          9590.
 681007005.     72.        ALLY     XFER STA    2./WK     4.362      NO          42577.
 681007013.     36.        ALLY     LND FILL    2./WK     3.362      NO          42511.
 681007006.     61.        ALLY     XFER STA    2./WK     1.581      NO          39116.
 681007014.     49.        ALLY     LND FILL    2./WK     1.581      NO          39116.
```

```
****************************************************************************************************

                              OPERATIONS DETAILED REPORT     December 26, 1970 thru
                                          .                  January 8, 1971
****************************************************************************************************

CONTROL     RCCL TO START OF ROUTE     COLLECTION          TRANSPORTATION      TIME COL/   QTY GEN/    QTY GEN/
              DISTANCE    TIME      DISTANCE    TIME     DISTANCE    TIME     RESID SVC   RESID/DAY  PERSON/DAY

 478006008.     4.23      17.86      24.06     470.00     20.43      85.71      0.97        7.47       2.80
 511002001.     3.00      11.44       4.27     145.44     32.11     109.44      0.34        5.14       1.88
 511002002.     4.79      20.11       4.80     273.56     46.18     198.00      1.21       13.09       2.68
 511005003.     2.00      10.00      13.00     247.50     46.00     190.00      0.59        9.31       1.53
 511999004.    21.00      60.00       4.00     334.50     57.00     190.80      0.62        7.55       1.90
 681001011.     1.00       5.00       5.25     253.75      5.70      31.25      0.67        7.44       2.32
 681003012.     1.50       7.50       7.25     355.00     14.00     110.00      1.12        8.61       2.46
 681007005.    20.68      30.00      72.86     386.40      0.0        0.0       0.15        4.73       1.46
 681007013.     5.40      39.00       0.0        0.0      35.12     480.00      0.0         4.73       1.46
 681007006.     7.57      15.00      51.02     415.67      0.0        0.0       0.21        5.54       1.72
 681007014.     5.40      38.00       0.0        0.0      40.15     480.00      0.0         5.54       1.72
```

```
****************************************************************************************************

                              COST BREAKDOWN DETAILED REPORT     December 26, 1970 thru
                                                                 January 8, 1971
****************************************************************************************************

CONTROL      COST TRAV   FQ COST    MP COST   TOT COST   FQ COST TO   MP COST    TOT COST   RATIO PROD                COST/SQ
             TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME   COST/DAY   MILE/WEEK

 478006009.     3.09      21.61      55.69      81.30       3.94       10.89      14.83      1.000         95.21      214.45
 511002001.     5.48      12.73      56.91      69.64       9.58       42.82      52.40      0.604        211.13     5053.58
 511002002.     9.64      24.05     107.04     131.09      17.41       77.47      94.88      1.000        235.61     4039.08
 511005003.     2.29      15.31      41.21      56.52      11.75       31.64      43.39      0.950        107.60      218.70
 511999004.    14.97      33.26      50.18      83.44      18.97       28.62      47.59      1.000        146.00      257.95
 681001011.     0.49       3.16      21.48      24.64       0.39        2.65       3.03      0.636         44.25      152.85
 681003012.     0.98       6.57      34.61      41.58       2.16       10.73      12.88      0.947         58.42      584.16
 681007005.    15.39      43.55     154.29     198.28       0.0         0.0        0.0       0.894        239.07      284.44
 681007013.     4.02       0.0        0.0        0.0       29.38       21.41      50.79      1.000         54.81       65.22
 681007006.     7.79      47.03     168.76     215.79       0.0         0.0        0.0       0.918        243.60      616.29
 681007014.     3.66       0.0        0.0        0.0       25.66       20.56      46.22      1.000         45.87      126.18
```

```
**************************************************
        POPULATION CHARACTERISTICS     December 26, 1970 thru
                                       January 8, 1971
**************************************************

CONTROL NO.     ECON LV   RES SVD   PROP SVD

 478006008.          4.      484.     1293.
 511002001.          2.     2156.     5905.
 511002002.          2.     1123.     5510.
 511005003.          8.      417.     1794.
 511999004.          7.     2665.    10640.
 681001011.         99.      380.     1214.
 681003012.          5.      318.     1113.
 681007005.          7.     5141.    16610.
 681007013.          7.     5141.    16610.
 681007006.          7.     4032.    13023.
 681007014.          7.     4032.    13023.
```

```
**********************************************************************************************
                                    SUMMARY REPORT     December 26, 1970 thru
                                                       January 8, 1971
**********************************************************************************************
CONTROL        PEOPLE S/WK  LGT OF ROUT  WEIGHT/DAY  COST/DAY  RATIO PROD/PD  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 474006008.        1293.       24.06       12660.       99.        1.000          2.80       15.67        0.15           0.41
 511002001.        5905.       21.11       15510.      211.        0.604          1.88       27.23        0.18           0.49
 511002002.        5510.       24.00       20657.      236.        1.000          2.68       22.80        0.21           1.04
 511005003.        1794.        6.00       24270.      108.        0.950          1.93        8.87        0.06           0.26
 511999004.       10640.       20.00       28373.      146.        1.000          1.90       10.29        0.07           0.27
 681001011.        1214.       10.60        5855.       44.        0.636          2.32        8.94        0.07           0.23
 631003012.        1113.        5.60        5580.       58.        0.947          2.46       12.20        0.10           0.37
 681007005.       16610.      145.72       42577.      239.        0.894          1.46       11.23        0.06           0.19
 681007013.       16610.       72.16       42511.       55.        1.000          1.46        2.58        0.01           0.04
 681007006.       13023.      102.03       35116.      244.        0.918          1.72       12.46        0.07           0.24
 681007014.       13033.       80.40       35116.       50.        1.000          1.72        2.55        0.02           0.05
```

106

```
*****************************************************************************************************************

                        VEHICLE - CREW DETAILED REPORT     January 9 thru January 22, 1971

*****************************************************************************************************************

CONTROL NO.                                 VEHICLE CHARACTERISTICS                             CREW CHARACTERISTICS
               TYPE          SIZE      AGE  LIFE EXP   COST    MAINT C/OP HR  CONSU C/OP HR   SIZE  HRLY RATE  WRK HRS/WK

 478004007.  REAR LOADER  25.CU YDS    2.      5.     18000.       0.180          0.384        4.     2.50        32.0
 478006008.  SIDE LOADER  20.CU YDS    4.      3.      8500.       0.960          0.544        3.     2.54        16.0
 511002001.  REAR LOADER  16.CU YDS    4.      5.     18000.       2.880          0.744        4.     4.05        40.0
 511002002.  REAR LOADER  16.CU YDS    4.      5.     18000.       2.880          0.671        4.     4.08        40.0
 511005003.  REAR LOADER  25.CU YDS    1.      5.     24000.       0.960          0.470        3.     3.33         8.0
 511999004.  REAR LOADER  25.CU YDS    2.      3.     23500.       1.260          1.052        3.     3.00        40.0
 681001011.  SIDE LOADER  20.CU YDS    4.     10.      7465.       0.120          0.245        2.     2.54        16.0
 681003012.  SIDE LOADER  16.CU YDS    4.     10.      7304.       0.300          0.466        3.     1.95        16.8
 681007005.        TRAIN  16.CU YDS    4.      4.     17560.       3.420          1.217       11.     2.10        32.0
 681007013. FRONT LOADER  24.CU YDS    4.      8.     28500.       0.960          1.157        0.     2.55        32.0
 681007006.        TRAIN  16.CU YDS    4.      4.     17560.       2.520          1.048       12.     2.05        32.0
 681007014. FRONT LOADER  26.CU YDS    4.      8.     26500.       0.960          0.971        1.     2.52        32.0
```

```
*****************************************************************************************************************

                        ROUTE DETAILED REPORT     January 9 thru January 22, 1971

*****************************************************************************************************************

CONTROL NO.                          ROUTE CHARACTERISTICS
            LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE   AREA SVC  SEPR RECD  AVG WEIGHT/DAY

 478004007.     14.        YARD    LND FILL    2./WK      0.724      YES         3885.
 478006008.     25.        YARD    LND FILL    2./WK      0.936      YES        10933.
 511002001.      4.        YARD    INCNRATR    1./WK      0.220      NO         11189.
 511002002.      5.        YARD    LND FILL    1./WK      0.278      NO         19789.
 511005003.      6.        CURB    LND FILL    1./WK      0.431      YES        24250.
 511999004.      4.        CURB    LND FILL    1./WK      2.450      NO         28370.
 681001011.     11.        CURB    LND FILL    2./WK      0.579      YES         9790.
 681003012.      6.        ALLY    LND FILL    2./WK      0.200      YES         8650.
 681007005.     70.        ALLY    XFER STA    2./WK      3.042      NO         42058.
 681007013.     36.        ALLY    LND FILL    2./WK      3.042      NO         42058.
 681007006.     57.        ALLY    XFER STA    2./WK      1.657      NO         34090.
 681007014.     37.        ALLY    LND FILL    2./WK      1.657      NO         33661.
```

OPERATIONS DETAILED REPORT January 9 thru January 22, 1971

CONTROL	POOL TO START OF ROUTE DISTANCE	POOL TO START OF ROUTE TIME	COLLECTION DISTANCE	COLLECTION TIME	TRANSPORTATION DISTANCE	TRANSPORTATION TIME	TIME COL/ RESID SVC	QTY GEN/ RESID/DAY	QTY GEN/ PERSON/DAY
478004007.	0.83	0.67	15.83	244.83	29.17	77.50	0.48	2.17	0.67
478006009.	4.70	15.00	25.30	430.00	19.50	79.38	0.88	6.39	2.39
511002001.	3.60	16.50	3.80	110.40	24.50	82.90	0.26	3.73	1.36
511002002.	4.68	33.50	4.70	258.80	34.22	128.30	1.21	13.21	2.71
511005003.	2.00	10.00	13.00	262.50	40.00	150.00	0.72	9.49	2.21
511999004.	21.00	60.00	4.00	330.00	57.00	183.00	0.61	7.55	1.90
681001011.	1.00	5.00	8.75	265.00	5.62	37.50	0.70	7.36	2.30
681003012.	1.25	11.25	4.50	343.75	12.00	95.00	1.05	5.97	1.71
681007005.	25.94	26.86	70.44	409.29	0.0	0.0	0.17	4.86	1.51
681007013.	5.40	30.86	0.0	0.0	41.31	480.00	0.0	4.86	1.51
681007006.	6.69	21.57	53.31	394.00	0.0	0.0	0.17	4.24	1.31
681007014.	5.40	39.00	0.0	0.0	37.29	480.00	0.0	4.18	1.30

COST BREAKDOWN DETAILED REPORT January 9 thru January 22, 1971

CONTROL	COST TRAV TO ROUT/D	EQ COST COL/DAY	MP COST COL/DAY	TOT COST TO COL/DAY	EQ COST TO TRANSP/DA	MP COST TRANSP/DA	TOT COST TRANSP/DA	RATIO PROD TO PAID TIME	COST/DAY	COST/SQ MILE/WEEK
478004007.	0.14	5.36	40.81	50.17	2.96	12.92	15.88	0.717	52.35	510.23
478006009.	7.62	20.54	54.61	75.15	3.79	10.09	13.87	1.000	91.65	195.72
511002001.	5.97	5.85	30.10	39.95	7.40	22.60	30.00	0.508	149.60	3400.05
511002002.	12.05	22.78	70.31	93.09	11.29	34.85	46.15	0.904	167.43	3011.25
511005003.	2.29	16.35	43.71	60.06	9.34	24.97	34.32	0.910	106.24	246.50
511999004.	15.08	33.43	49.50	82.93	18.54	27.45	45.99	1.000	144.00	293.87
681001011.	0.48	3.20	22.44	25.63	0.45	3.18	3.63	0.671	44.35	153.19
681003012.	1.31	6.22	32.54	38.76	1.77	9.26	11.03	0.891	57.34	573.35
681007005.	13.35	45.91	157.08	203.00	0.0	0.0	0.0	0.926	233.61	307.18
681007013.	2.53	0.0	0.0	0.0	30.64	8.75	39.39	1.000	41.93	55.13
681007006.	10.87	37.79	161.31	198.61	0.0	0.0	0.0	0.888	235.86	569.33
681007014.	3.91	0.0	0.0	0.0	29.15	20.19	49.34	1.000	53.25	128.53

```
**********************************************

     POPULATION CHARACTERISTICS       January 9 thru January 22, 1971

**********************************************

CONTROL NO.    EQUN LV  RES SVD  PEOP SVD

 478004007.        8.     1023.     3335.
 478006009.        4.      485.     1306.
 511002001.        2.     2141.     5865.
 511002002.        2.     1070.     5214.
 511005003.        8.      365.     1570.
 511999004.        7.     2685.    10640.
 681001011.       99.      380.     1216.
 681003012.        5.      318.     1113.
 681007005.        7.     4541.    15965.
 681007013.        7.     4541.    15965.
 681007006.        7.     4600.    14942.
 681007014.        7.     4600.    14942.



********************************************************************************************************************

                                        SUMMARY REPORT    January 9 thru January 22, 1971

********************************************************************************************************************

CONTROL       PEOPLE S/WK  LOT OF POLT  WEIGHT/DAY  COST/DAY  RATIO PROC/PC  QTY GEN/P/C  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478004007.       3335.       27.00        3885.        92.       0.717          0.67        47.54          0.11          0.36
 478006009.       1306.       25.30       10533.        92.       1.000          2.39        16.77          0.14          0.37
 511002001.       5865.       19.00       11135.       150.       0.509          1.36        26.74          0.13          0.35
 511002002.       5214.       23.50       15785.       167.       0.904          2.71        16.52          0.16          0.78
 511005003.       1570.        6.00       24250.       106.       0.910          2.21         9.76          0.07          0.29
 511999004.      10640.       20.00       28370.       144.       1.000          1.90        10.15          0.07          0.27
 681001011.       1216.       10.60        9750.        46.       0.671          2.30         9.06          0.07          0.23
 681003012.       1113.        5.60        6650.        57.       0.891          1.71        17.24          0.10          0.36
 681007005.      15965.      140.55       42059.       234.       0.926          1.51        11.11          0.06          0.19
 681007013.      15965.       77.57       42058.        42.       1.000          1.51         1.59          0.01          0.03
 681007006.      14942.      106.63       34090.       236.       0.888          1.31        13.84          0.06          0.21
 681007014.      14942.       74.65       33661.        53.       1.000          1.30         3.16          0.01          0.05
```

```
******************************************************************************************************
             VEHICLE - CREW DETAILED REPORT      December 12 thru December 25, 1970
******************************************************************************************************

CONTROL NO.                          VEHICLE CHARACTERISTICS                                  CREW CHARACTERISTICS
              TYPE          SIZE     AGE  LIFE EXP   COST   MAINT C/CP HR  CONSU C/CP HR   SIZE  HRLY RATE  WRK HRS/WK

 474006008.  SIDE LOADER  20.CU YDS   3.     3.      8500.      0.960          0.365         3.     2.54        16.0
 511002001.  REAR LOADER  16.CU YDS   4.     5.     18000.      2.880          0.706         6.     4.06        40.0
 511002002.  REAR LOADER  16.CU YDS   4.     5.     18000.      2.880          0.489         6.     4.06        40.0
 511005004.  REAR LOADER  25.CU YDS   1.     5.     24000.      0.960          0.511         3.     3.33         8.0
 511999004.  REAR LOADER  25.CU YDS   1.     3.     23500.      1.260          0.860         3.     3.00        40.0
 681001011.  SIDE LOADER  20.CU YDS   4.    10.      7465.      0.120          0.294         2.     2.54        16.0
 681003012.  SIDE LOADER  16.CU YDS   3.    10.      8170.      0.300          0.442         3.     1.55        16.8
 681007005.        TRAIN  16.CU YDS   4.     4.     17560.      2.520          1.198        11.     2.01        32.0
 681007013. FRONT LOADER  26.CU YDS   4.     8.     28500.      0.960          1.133         1.     2.54        32.0
 681007006.        TRAIN  16.CU YDS   4.     4.     17560.      3.420          1.122        12.     2.14        32.0
 681007014. FRONT LOADER  26.CU YDS   4.     8.     28500.      0.960          0.821         1.     2.62        32.0
```

```
******************************************************************************************************
                         ROUTE DETAILED REPORT          December 12 thru December 25, 1970
******************************************************************************************************

CONTROL NO.                          ROUTE CHARACTERISTICS
             LENGTH/DAY  TYPE SERV  DISCG PT  SCHEDULE  AREA SVD  SEPR RECD  AVG WEIGHT/DAY

 474006008.     21.         YARD    LND FILL   2./WK     0.960       YES         11611.
 511002001.      3.         YARD    INCNRATR   1./WK     0.230       NO          12287.
 511002002.      5.         YARD    LND FILL   1./WK     0.300       NO          17165.
 511005003.      6.         CURB    LND FILL   1./WK     0.553       YES         22500.
 511999004.      4.         CURB    LND FILL   1./WK     2.450       NO          29943.
 681001111.     11.         CURB    LND FILL   2./WK     0.579       YES          9704.
 681003012.      6.         ALLY    LND FILL   2./WK     0.200       YES          5645.
 681007005.     70.         ALLY    XFER STA   2./WK     2.914       NO          40631.
 681007013.     41.         ALLY    LND FILL   2./WK     2.914       NO          40631.
 681007006.     52.         ALLY    XFER STA   2./WK     1.587       NO          36828.
 681007014.     30.         ALLY    LND FILL   2./WK     1.587       NO          36828.
```

```
******************************************************************************************
                         OPERATIONS DETAILED REPORT        December 12 thru December 25, 1970
******************************************************************************************

CONTROL      FUEL TO START OF ROUTE    COLLECTION          TRANSPORTATION     TIME COL/   QTY GEN/    QTY GEN/
               DISTANCE     TIME     DISTANCE   TIME      DISTANCE    TIME     RESID SVD  RESID/DAY  PERSON/DAY

 478006008.      4.15       15.00     21.05    484.38     21.13      91.88      0.97        6.68       2.50
 511002001.      3.44        9.79      2.78     92.44     29.11     140.56      0.21        4.07       1.49
 511002002.      4.94       15.25      4.55    217.00     33.40     170.63      0.97       11.00       2.24
 511005003.      1.80       10.00      4.00    180.00     45.00     230.00      0.39        6.85       1.59
 511999004.     21.00       60.00      4.00    340.00     60.00     205.11      0.63        7.57       2.01
 681001011.      1.00        5.00      9.32    233.00      4.92      29.00      0.61        7.30       2.28
 681003012.      3.00       10.00      7.50    306.25     12.10      93.75      0.96        5.07       1.45
 681007005.     23.46       30.00     70.04    430.60      0.0        0.0       0.19        4.73       1.46
 681007013.      5.40       28.00      0.0       0.0      41.02     480.00      0.0         4.73       1.46
 681007006.      7.21       15.00     52.49    430.66      0.0        0.0       0.19        4.56       1.41
 681007014.      5.40       28.00      0.0       0.0      39.43     480.00      0.0         5.48       1.41


******************************************************************************************
                      COST BREAKDOWN DETAILED REPORT        December 12 thru December 25, 1970
******************************************************************************************

CONTROL      COST TRAV   FO COST    MP COST   TOT COST  FO COST TO   MP COST    TOT COST   RATIO PROD              COST/SQ
             TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY  TRANSP/DA  TRANSP/DA  TRANSP/DA  TO PAID TIME  COST/DAY  MILE/WEEK

 478006001.     2.58      21.70      61.52     83.21       4.12      11.67      15.78       1.000      101.57     211.50
 511002001.     4.04       8.19      37.53     45.72      12.45      57.07      69.52       0.555      216.39    5179.60
 511002002.     7.49      18.44      88.10    106.55      14.50      69.27      83.78       0.863      229.12    3918.70
 511005003.     2.29      11.34      29.97     41.31      14.49      38.29      52.78       0.906      106.37     192.36
 511999004.    14.89      33.35      51.00     84.35      20.12      30.77      50.89       1.000      150.13     306.38
 681001011.     0.49       7.00      15.73     22.73       0.37       2.46       2.83       0.591       44.08     152.26
 681003012.     1.15       5.79      29.86     35.65       1.77       9.14      10.91       0.839       56.89     568.94
 681007005.    13.37      41.83     158.68    200.51       0.0        0.0        0.0        0.968      221.63     304.22
 681007013.     4.02       0.0        0.0       0.0       30.44      20.34      50.78       1.000       54.80      75.22
 681007006.     9.11      47.77     184.78    232.55       0.0        0.0        0.0        0.943      255.29     643.60
 681007014.     3.87       0.0        0.0       0.0       27.95      20.93      48.88       1.000       52.75     132.98
```

```
**************************************************

     POPULATION CHARACTERISTICS        December 12 thru December 25, 1970

**************************************************

CONTROL NO.     ECON LV  RES SVD  PEOP SVD

 479006334.         4.     457.     1327.
 511002001.         2.    2156.     5905.
 511002002.         2.    1115.     5465.
 511005001.         8.     465.     2017.
 511004006.         7.    2655.    10640.
 681001011.        03.     360.     1216.
 681004012.         5.     318.     1113.
 681007005.         7.    4507.    15856.
 681007013.         7.    4507.    15858.
 681007006.         7.    4612.    14858.
 681007014.         7.    3942.    14858.
```

```
****************************************************************************************************

                                                 SUMMARY REPORT        December 12 thru December 25, 1970

****************************************************************************************************

CONTROL        PEOPLE S/WK  PCT OF BUILT  WEIGHT/DAY   COST/DAY  RATIO PROD/PC  CTY GEN/P/C  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 479006334.       1327.        21.05        11611.       102.        1.000         2.50        17.50         0.15          0.41
 511002001.       5905.        15.58        12287.       216.        0.555         1.49        35.22         0.18          0.50
 511002002.       5465.        34.78        17165.       229.        0.363         2.24        26.70         0.21          1.03
 511005001.       2017.         6.00        22500.       106.        0.936         1.59         9.46         0.05          0.23
 511004006.      13660.        23.00        23547.       150.        1.000         2.01        10.03         0.07          0.28
 681001011.       1216.        10.60         5704.        44.        0.591         2.28         9.08         0.07          0.23
 681004012.       1113.         5.60         5645.        57.        0.839         1.45        20.16         0.10          0.36
 681007005.      15856.       140.02        40631.       222.        0.968         1.46        10.91         0.06          0.18
 681007013.      15858.        82.04        40631.        55.        1.000         1.45         2.70         0.01          0.04
 681007006.      14490.       104.57        34828.       255.        0.943         1.41        13.86         0.07          0.22
 681007014.      14858.        78.57        34828.        53.        1.000         1.41         2.86         0.01          0.05
```

```
************************************************************************************************************

                        VEHICLE - CREW DETAILED REPORT        November 28 thru December 11, 1970

************************************************************************************************************

CONTROL NO.                                    VEHICLE CHARACTERISTICS                                        CREW CHARACTERISTICS
              TYPE           SIZE       AGE  LIFE EXP    COST   MAINT C/CP HR  CONSU C/CP HR     SIZE  HRLY RATE  WRK HRS/WK

 479006008.  SIDE LOADER   20.CU YDS    3.      3.       8500.      0.960          0.450           3.     2.54        16.0
 511002001.  REAR LOADER   20.CU YDS    4.      5.      13000.      2.880          0.704           6.     4.06        40.0
 511002002.  REAR LOADER   16.CU YDS    4.      5.      18000.      2.990          0.549           6.     4.06        40.0
 511005003.  REAR LOADER   25.CU YDS    1.      5.      24000.      0.960          0.537           3.     3.33         8.0
 511999004.  REAR LOADER   25.CU YDS    1.      3.      23500.      1.760          0.972           3.     3.00        40.0
 681001011.  SIDE LOADER   20.CU YDS    4.     10.       7465.      0.120          0.313           2.     2.54        16.0
 681003012.  SIDE LOADER   18.CU YDS    4.     10.       7304.      0.300          0.424           3.     1.95        16.8
 681007005.        TRAIN   18.CU YDS    4.      4.      17560.      3.420          1.577          11.     2.01        32.0
 681007013. FRONT LOADER   28.CU YDS    4.      8.      28500.      0.960          1.517           1.     2.43        32.0
 681007006.        TRAIN   18.CU YDS    4.      4.      17560.      3.420          1.447          12.     2.07        32.0
 681007014. FRONT LOADER   28.CU YDS    4.      8.      28500.      0.960          1.174           1.     2.52        32.0


************************************************************************************************************

                        ROUTE DETAILED REPORT         November 28 thru December 11, 1970

************************************************************************************************************

CONTROL NO.                              ROUTE CHARACTERISTICS
             LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVC  SEPR RECD  AVG WEIGHT/DAY

 479006008.     22.        YARD     LND FILL    2./WK     0.927      YES          9986.
 511002001.      4.        YARD     LND FILL    1./WK     0.220      NO          12162.
 511002002.      6.        YARD     INCNRATR    1./WK     0.278      NO          15383.
 511005003.      6.        CURB     LND FILL    1./WK     0.573      YES         13525.
 511999004.      4.        CURB     LND FILL    1./WK     2.450      NO          27885.
 681001011.     11.        CURB     LND FILL    2./WK     0.579      NO          10770.
 681003012.      6.        ALLY     LND FILL    2./WK     0.200      YES          6123.
 681007005.     73.        ALLY     XFER STA    2./WK     3.223      NO          44049.
 681007013.     60.        ALLY     LND FILL    2./WK     3.238      NO          44027.
 681007006.     53.        ALLY     XFER STA    2./WK     1.623      NO          39657.
 681007014.     40.        ALLY     LND FILL    2./WK     1.623      NO          39657.
```

OPERATIONS DETAILED REPORT   November 28 thru December 11, 1970

CONTROL	POOL TO START OF ROUTE DISTANCE	POOL TO START OF ROUTE TIME	COLLECTION DISTANCE	COLLECTION TIME	TRANSPORTATION DISTANCE	TRANSPORTATION TIME	TIME COL/ RESID SVC	QTY GEN/ RESID/DAY	QTY GEN/ PERSON/DAY
478006008.	4.23	16.43	22.49	445.71	18.57	77.14	0.92	5.89	2.21
511002001.	3.00	10.65	4.20	112.30	31.80	111.40	0.26	4.06	1.48
511002002.	3.51	17.70	5.63	195.30	24.78	194.20	0.87	10.27	2.11
511005003.	1.90	10.00	4.00	235.00	43.00	185.00	0.49	3.94	0.92
511999004.	21.33	60.00	4.00	291.00	57.00	193.70	0.54	7.42	1.87
681001011.	1.00	5.00	5.80	257.75	5.35	38.50	0.68	8.10	2.53
681003012.	1.50	10.00	7.75	323.75	12.28	93.75	1.02	5.50	1.57
681007005.	20.59	30.00	153.36	465.00	0.0	0.0	0.18	4.93	1.53
681007013.	5.40	38.00	0.0	0.0	39.96	480.00	0.0	4.53	1.52
681007006.	6.69	15.00	53.20	410.57	0.0	0.0	0.20	5.21	1.61
681007014.	5.43	38.00	0.0	0.0	39.77	480.00	0.0	5.21	1.61

COST BREAKDOWN DETAILED REPORT   November 28 thru December 11, 1970

CONTROL	COST TRAV TO ROUT/D	FO COST COL/DAY	MP COST COL/DAY	TOT COST TO COL/DAY	FO COST TO TRANSP/DA	MP COST TRANSP/DA	TOT COST TRANSP/DA	RATIO PROD TO PAID TIME	COST/DAY	COST/SQ MILE/WEEK
478006008.	2.85	20.59	56.61	77.20	3.56	9.80	13.36	1.000	53.41	201.59
511002001.	5.24	9.95	45.59	55.54	9.87	45.23	55.10	0.527	215.64	4900.80
511002002.	9.71	15.53	75.23	91.17	16.70	78.85	95.54	0.853	225.04	4119.34
511005003.	2.30	14.90	39.13	54.03	11.73	30.80	42.53	0.922	107.19	185.45
511999004.	15.90	29.09	43.65	72.74	19.31	28.99	48.29	1.000	136.03	277.61
681001011.	0.43	3.40	21.82	25.23	0.51	3.26	3.77	0.661	44.62	154.12
681003012.	1.15	5.80	31.57	37.37	1.68	9.14	10.82	0.869	56.80	567.99
681007005.	14.59	54.66	171.35	226.01	0.0	0.0	0.0	1.000	240.59	291.81
681007013.	4.19	0.0	0.0	0.0	33.52	19.42	52.93	1.000	57.12	69.28
681007006.	7.95	50.07	178.26	228.34	0.0	0.0	0.0	0.543	250.54	617.59
681007014.	4.03	0.0	0.0	0.0	30.77	20.19	50.97	1.000	55.00	135.58

Reproduced from best available copy.

```
**************************************************

        POPULATION CHARACTERISTICS          November 28 thru December 11, 1970

**************************************************

CONTROL NO.     ECON LV  RES SVD  PEOP SVD

 478006008.        4.      484.     1293.
 511002001.        2.     2141.     5365.
 511002002.        4.     1070.     5214.
 511005003.        3.      450.     2107.
 511999004.        7.     2665.    10640.
 681001011.       99.      380.     1216.
 681003012.        5.      318.     1113.
 681007005.        7.     5107.    16503.
 681007013.        7.     5107.    16503.
 681007006.        7.     4352.    14056.
 681007014.        7.     4352.    14056.
```

```
*********************************************************************************************************

                                                  SUMMARY REPORT          November 28 thru December 11, 1970

*********************************************************************************************************

CONTROL         PEOPLE S/WK  LGT OF HAUL   WEIGHT/DAY   COST/DAY  RATIO PROC/PR  QTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 478006009.         1293.        22.45         5586.        93.          1.000         2.21       18.71          0.14          0.39
 511002001.         5365.        21.00        12162.       216.          0.537         1.48       35.46          0.18          0.50
 511002002.         5214.        29.19        15363.       229.          0.853         2.11       29.78          0.22          1.07
 511005003.         2107.         6.00        13525.       107.          0.922         0.92       15.85          0.05          0.22
 511999004.        10640.        20.00        27885.       136.          1.000         1.87        9.76          0.06          0.25
 681001011.         1216.        10.60        10770.        45.          0.661         2.53        8.29          0.07          0.23
 681003012.         1113.         5.60         6123.        57.          0.869         1.57       18.55          0.10          0.36
 681007005.        16503.       145.09        44049.       241.          1.000         1.53       10.92          0.06          0.19
 681007013.        16503.        79.51        44027.        57.          1.000         1.52        2.59          0.01          0.04
 681007006.        14056.       106.40        35657.       251.          0.943         1.61       12.64          0.07          0.23
 681007014.        14056.        73.66        35657.        55.          1.000         1.61        2.77          0.02          0.05
```

```
*****************************************************************************************************

                            VEHICLE - CREW DETAILED REPORT        November 14 thru November 27, 1970

*****************************************************************************************************

CONTROL NO.                                 VEHICLE CHARACTERISTICS                              CREW CHARACTERISTICS
                TYPE          SIZE      AGE  LIFE EXP   COST   MAINT C/OP HR  CONSU C/OP HR   SIZE  HRLY RATE  WRK HRS/WK

 511002001.   REAR LOADER   16.CU YDS    4.      5.     18000.       2.880          0.540        6.      4.06        40.0
 511002002.   REAR LOADER   16.CU YDS    4.      5.     18000.       2.880          0.507        6.      4.06        40.0
 511005003.   REAR LOADER   25.CU YDS    1.      5.     24000.       0.960          0.466        3.      3.33         8.0
 511999004.   REAR LOADER   25.CU YDS    1.      3.     23500.       1.260          0.909        3.      3.00        40.0
 681001011.   SIDE LOADER   20.CU YDS    4.     10.      7465.       0.120          0.296        2.      2.54        16.0
 681003012.   SIDE LOADER   18.CU YDS    4.     10.      7304.       0.300          0.428        3.      1.95        16.8
 681007005.         TRAIN   18.CU YDS    4.      4.     17560.       2.520          1.147       11.      1.57        32.0
 681007013.  FRONT LOADER   26.CU YDS    4.      8.     28500.       0.960          1.110        1.      2.42        32.0
 681007006.         TRAIN   18.CU YDS    4.      4.     17560.       3.420          0.973       12.      2.07        32.0
 681007014.  FRONT LOADER   26.CU YDS    4.      8.     28500.       0.960          1.030        1.      2.76        32.0
```

```
*****************************************************************************************************

                            ROUTE DETAILED REPORT        November 14 thru November 27, 1970

*****************************************************************************************************

CONTROL NO.                           ROUTE CHARACTERISTICS
            LENGTH/DAY  TYPE SERV  DISCG PT   SCHEDULE  AREA SVC  SEPR RECC  AVG WEIGHT/DAY

 511002001.     3.         YARD    INCNRATR    1./WK     0.220       NO          10496.
 511002002.     7.         YARD    INCNRATR    1./WK     0.301       NO          15895.
 511005003.     6.         CURB    LND FILL    1./WK     0.536       YES         22020.
 511999004.     4.         CURB    LND FILL    1./WK     2.450       NO          28794.
 681001011.    11.         CURB    LND FILL    2./WK     0.579       NO           7640.
 681003012.     6.         ALLY    LND FILL    2./WK     0.200       YES          6210.
 681007005.    71.         ALLY    XFER STA    2./WK     3.138       NO          40231.
 681007013.    42.         ALLY    LND FILL    2./WK     3.138       NO          40231.
 681007006.    54.         ALLY    XFER STA    2./WK     1.651       NO          40745.
 681007014.    45.         ALLY    LND FILL    2./WK     1.651       NO          40745.
```

```
**************************************************************************************************

                                 OPERATIONS DETAILED REPORT        November 14 thru November 27, 1970

**************************************************************************************************

CONTROL      POOL TO START OF ROUTE    COLLECTION           TRANSPORTATION      TIME COL/   QTY GEN/    QTY GEN/
               DISTANCE     TIME     DISTANCE    TIME     DISTANCE    TIME      RESID SVD   RESID/DAY  PERSON/DAY

 511002001.       3.60      11.40       3.40    101.00      20.40     83.20       0.24        3.50       1.28
 511002002.       2.30      19.73       6.67    196.27       5.79    104.45       0.96       11.11       2.28
 511005003.       2.00      10.00       7.00    200.00      41.50    197.50       0.44        6.53       1.61
 511999004.      21.00      60.00       4.00    306.00      60.00    205.20       0.57        7.66       1.53
 681001011.       1.00       4.50      10.60    247.75       4.80     37.00       0.65        5.74       1.80
 681003012.       1.75       8.75       8.00    318.75      12.00     96.25       1.00        5.58       1.55
 681007005.      20.35      30.00      65.52    412.67       0.0       0.0        0.16        4.58       1.42
 681007013.       5.40      38.00       0.0       0.0       41.73    480.00       0.0         4.58       1.42
 681007006.       7.32      15.00      83.52    485.40       0.0       0.0        0.23        5.42       1.68
 681007014.       5.43      38.00       0.0       0.0       45.66    480.00       0.0         5.42       1.68


**************************************************************************************************

                                 COST BREAKDOWN DETAILED REPORT        November 14 thru November 27, 1970

**************************************************************************************************

CONTROL      COST TRAV   EQ COST    MP COST   TOT COST   EQ COST TO   MP COST    TOT COST   RATIO PROD               COST/SQ
             TO ROUT/D   COL/DAY    COL/DAY  TO COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME  COST/DAY  MILE/WEEK

 511002001.     5.61       6.67      41.01     45.68        7.14       33.78      40.92       0.455       211.67    4810.71
 511002002.     9.63      16.74      79.69     96.43        8.91       47.41      51.32       0.708       222.21    3686.79
 511005003.     2.29      12.45      33.30     45.75       12.29       32.88      45.17       0.985       105.28     196.41
 511999004.    14.94      30.27      45.90     76.17       20.39       30.78      51.08       1.000       142.18     290.17
 681001011.     0.44       3.20      20.58     24.17        0.48        3.13       3.61       0.636        44.37     153.28
 681003012.     1.01       5.73      31.09     36.81        1.73        9.38      11.11       0.862        56.76     567.59
 681007005.    13.72      35.74     149.04    188.78        0.0         0.0        0.0        0.938       215.59     275.32
 681007013.     3.93       0.0        0.0       0.0        30.26       19.32      49.58       1.000        53.51      68.21
 681007006.     7.94      52.62     200.96    253.57        0.0         0.0        0.0        1.000       261.41     633.15
 681007014.     4.03       0.0        0.0       0.0        29.62       22.10      51.72       1.000        55.81     135.19
```

```
**************************************************

      POPULATION CHARACTERISTICS          November 14 thru November 27, 1970

**************************************************

CONTROL NO.     ECON LV   RES SVD   PROP SVD

 511002001.         2.      2141.      5865.
 511002002.         4.      1022.      4972.
 511005003.         8.       454.      1953.
 511000004.         7.      2685.     10640.
 681001011.        10.       280.      1216.
 681003012.         5.       318.      1113.
 681007005.         7.      5024.     16234.
 681007013.         7.      5024.     16234.
 681007006.         7.      4200.     13888.
 681007014.         7.      4200.     13888.
```

```
****************************************************************************************************

                                            SUMMARY REPORT        November 14 thru November 27, 1970

****************************************************************************************************

CONTROL        PEOPLE S/WK  LBS OF POLT  WEIGHT/DAY   COST/DAY  RATIO PROD/PD  CTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 511002001.        5865.        17.00       10456.       212.        0.455          1.28        40.23         0.18          0.49
 511002002.        4972.        33.36       15855.       222.        0.708          2.28        27.96         0.22          1.09
 511005003.        1953.         6.00       22020.       105.        0.355          1.61         5.56         0.05          0.23
 511000004.       10640.  [illegible]       28794.       142.        1.000          1.93         9.89         0.07          0.26
 681001011.        1216.        10.60        7640.        44.        0.536          1.80        11.62         0.07          0.23
 681003012.        1113.         5.60        6210.        57.        0.862          1.59        18.28         0.10          0.36
 681007005.       16234.       142.37       40231.       216.        0.938          1.42        10.74         0.05          0.17
 681007013.       16234.        83.41       40231.        54.        1.000          1.42         2.66         0.01          0.04
 681007006.       13888.       107.84       40745.       261.        1.000          1.68        12.83         0.08          0.24
 681007014.       13888.        92.08       40745.        56.        1.000          1.68         2.74         0.02          0.05
```

```
**************************************************************************************************************

                              VEHICLE - CREW DETAILED REPORT       October 31 thru November 13, 1970

**************************************************************************************************************

CONTROL NO.                                   VEHICLE CHARACTERISTICS                            CREW CHARACTERISTICS
              TYPE          SIZE      AGE  LIFE EXP   COST   MAINT C/CP HR  CONSU C/CP HR   SIZE  HRLY RATE  WRK HRS/WK

 511002001.  REAR LOADER  16.CU YDS   4.      5.     18000.       2.880          0.611       6.     4.06        40.0
 511002002.  REAR LOADER  16.CU YDS   4.      5.     18000.       2.880          0.467       6.     4.06        40.0
 511005003.  REAR LOADER  25.CU YDS   1.      5.     24000.       0.360          0.476       3.     3.33         8.0
 681001011.  SIDE LOADER  20.CU YDS   4.     10.      7465.       0.120          0.115       2.     2.54        16.0
 681003012.  SIDE LOADER  16.CU YDS   3.     10.      8170.       0.300          0.486       3.     1.55        16.8
 681007006.        TRAIN  15.CU YDS   4.      4.     17560.       3.420          1.342      12.     2.10        32.0
 681007014.  FRONT LOADER 26.CU YDS   4.      8.     28500.       0.0            0.972       1.     2.57        32.0


**************************************************************************************************************

                              ROUTE DETAILED REPORT       October 31 thru November 13, 1970

**************************************************************************************************************

CONTROL NO.                            ROUTE CHARACTERISTICS
             LENGTH/DAY  TYPE SERV  DISCG PT  SCHEDULE  AREA SVD  SEPR RECD  AVG WEIGHT/DAY

 511002001.      4.         YARD    INCNRATR   1./WK     0.220       NO          11284.
 511002002.      7.         YARD    INCNRATR   1./WK     0.278       NO          18002.
 511005003.      6.         CURB    LND FILL   1./WK     0.431       YES         24387.
 681001011.     11.         CURB    LND FILL   2./WK     0.570       NO           9360.
 681003012.      6.         ALLY    LND FILL   2./WK     0.200       YES          6300.
 681007006.     57.         ALLY    XFER STA   2./WK     1.614       NO          34107.
 681007014.     40.         ALLY    LND FILL   2./WK     1.614       NO          34107.
```

```
***********************************************************************************************

                              OPERATIONS DETAILED REPORT        October 31 thru November 13, 1970

***********************************************************************************************

CONTROL      FEED TO START OF ROUTE      COLLECTION           TRANSPORTATION      TIME COL/   QTY GEN/    QTY GEN/
                DISTANCE    TIME      DISTANCE    TIME      DISTANCE    TIME     RESID SVC   RESID/DAY  PERSON/DAY

 511002001.       3.40       9.70       8.20     107.10      19.90      84.50       0.25        3.76        1.37
 511002002.       2.34      20.30       6.56     213.60       6.18      69.40       1.00       12.02        2.47
 511005003.       2.00      10.00       5.00     275.00      47.50     142.50       0.75        9.54        2.22
 681001011.       1.33       3.50      10.60     250.00       6.85      33.00       0.66        7.04        2.20
 681003012.       2.00      15.00       8.00     255.00      12.00     112.50       0.93        5.66        1.62
 681007006.       6.95      15.00      53.05     420.25       0.0        0.0        0.19        4.35        1.35
 681007014.       5.40      38.00       0.0        0.0       40.35     480.00       0.0         4.35        1.35
```

```
***********************************************************************************************

                              COST BREAKDOWN DETAILED REPORT        October 31 thru November 13, 1970

***********************************************************************************************

CONTROL       COST TRAV   FD COST    MP COST   TOT COST   FC COST TC   MP COST    TOT COST   RATIO PROD                 COST/SQ
              TO ROUT/D   COL/DAY    COL/DAY  TC COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME   COST/DAY   MILE/WEEK

 511002001.     4.78        9.32      43.49     52.80        7.35       34.31      41.66       0.467        212.40     4827.25
 511002002.     3.06       18.08      86.72    104.80        5.87       28.18      34.05       0.675        220.55     3966.68
 511005003.     2.20       17.14      45.79     62.95        8.89       23.73      32.62       0.518        106.60      247.33
 681001011.     0.33        2.47      21.17     23.64        0.33        2.79       3.12       0.623         43.48      150.18
 681003012.     1.76        5.79      28.76     34.56        2.21       10.97      13.18       0.862         57.44      574.38
 681007006.     4.03       48.14     176.72    224.35        0.0         0.0        0.0        0.925        251.70      623.92
 681007014.     3.33        0.0        0.0       0.0        21.48       20.56      42.04       1.000         45.37      112.46
```

```
*************************************************

        POPULATION CHARACTERISTICS        October 31 thru November 13, 1970

*************************************************

CONTROL NO.     ECON LV   RES SVD   PEOP SVD

 511002001.          2.      2141.      5865.
 511002002.          4.      1070.      5214.
 511005003.          8.       365.      1570.
 681001011.         59.       380.      1216.
 681003012.          5.       316.      1113.
 681007006.          7.      4482.     14477.
 681007014.          7.      4482.     14477.



*****************************************************************************************************************

                                                  SUMMARY REPORT        October 31 thru November 13, 1970

*****************************************************************************************************************

CONTROL        PEOPLE S/WK  LGT OF ROUT   WEIGHT/DAY   COST/DAY  RATIO PROD/RD  QTY GEN/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 511002001.        5865.        18.50       11284.        212.       0.467          1.37        37.65       0.18          0.50
 511002002.        5214.        34.80       18002.        221.       0.675          2.47        24.50       0.21          1.03
 511005003.        1570.         6.00       24357.        107.       0.918          2.27         8.74       0.07          0.29
 681001011.        1216.        10.60        5360.         43.       0.623          2.20         9.29       0.07          0.23
 681003012.        1113.         5.60        6300.         57.       0.862          1.62        19.23       0.10          0.36
 681007005.       14477.       106.10       34107.        252.       0.925          1.35        14.76       0.07          0.22
 681007014.       14477.        80.60       34107.         45.       1.000          1.35         2.66       0.01          0.04
```

```
*****************************************************************************************************
                         VEHICLE - CREW DETAILED REPORT       October 19 thru October 30, 1970
*****************************************************************************************************
CONTROL NO.
                                          VEHICLE CHARACTERISTICS                                           CREW CHARACTERISTICS
                TYPE          SIZE      AGE  LIFE EXP   COST    MAINT C/OP HR   CONSU C/OP HR    SIZE  HRLY RATE  WRK HRS/WK

511002001.   REAR LOADER  20.CU YDS     4.      5.     14000.       2.880           0.641          6.      4.06        40.0
511002002.   REAR LOADER  16.CU YDS     4.      5.     19000.       2.930           0.463          6.      4.06        40.0
511005003.   REAR LOADER  25.CU YDS     1.      5.     24000.       0.960           0.497          3.      3.33         8.0
681007006.         TRAIN  18.CU YDS     4.      4.     17560.       0.0             1.357         12.      2.00        32.0
681007014.  FRONT LOADER  26.CU YDS     4.      9.     28500.       0.0             1.279          1.      2.53        32.0
```

```
*****************************************************************************************************
                         ROUTE DETAILED REPORT       October 19 thru October 30, 1970
*****************************************************************************************************
CONTROL NO.
                                      ROUTE CHARACTERISTICS
              LENGTH/DAY  TYPE SERV  DISPG PT  SCHEDULE  AREA SVD  SEPR REQD  AVG WEIGHT/DAY

511002001.        4.         YARD    INCNRATR   1./WK     0.220       NO          14036.
511002002.        7.         YARD    INCNRATR   1./WK     0.278       NO          17015.
511005003.        6.         COMB    LND FILL   1./WK     0.431       YES         23474.
681007006.       52.         ALLY    XFER STA   2./WK     1.579       NO          36431.
681007014.       37.         ALLY    LND FILL   2./WK     1.579       NO          36431.
```

```
**************************************************************************************************

                         OPERATIONS DETAILED REPORT          October 19 thru October 30, 1970

**************************************************************************************************

CONTROL       POOL TO START OF ROUTE      COLLECTION            TRANSPORTATION       TIME COL/   QTY GEN/    QTY GEN/
               DISTANCE      TIME       DISTANCE     TIME      DISTANCE     TIME    RESID SVC   RESID/DAY  PERSON/DAY

 511002001.       3.60       11.80         6.50     124.90      21.40       89.10      0.29        4.68       1.71
 511002002.       2.34       22.50         6.96     206.50       6.18      116.10      0.97       11.36       2.33
 511005003.       1.80       10.00         6.00     237.50      49.00      150.00      0.65        9.19       2.14
 681007006.       6.74       15.00        52.29     410.00       0.0         0.0       0.18        4.54       1.41
 681007014.       5.40       38.00         0.0        0.0       37.07      480.00      0.0         4.54       1.41
```

```
**************************************************************************************************

                         COST BREAKDOWN DETAILED REPORT          October 19 thru October 30, 1970

**************************************************************************************************

CONTROL        COST TRAV    EQ COST     MP COST   TOT COST   EQ COST TO   MP COST    TOT COST   RATIO PROD                COST/SQ
               TO ROUT/D    COL/DAY     COL/DAY  TO COL/DAY  TRANSP/DA   TRANSP/DA  TRANSP/DA  TO PAID TIME   COST/DAY   MILE/WEEK

 511002001.       5.82       10.93       50.71      61.64       7.71       35.77      43.48       0.517        214.56    4876.25
 511002002.      11.04       17.50       84.00     101.50       9.82       47.14      56.95       0.755        274.10    4030.55
 511005003.       2.29       14.90       39.54      54.44       9.41       24.97      34.39       0.869        104.86     243.29
 681007006.       6.86       23.70      163.73     187.42       0.0         0.0        0.0        0.858        216.24     547.93
 681007014.       3.74        0.0         0.0        0.0       23.93       18.25      42.18       1.000         45.52     115.34
```

```
**********************************************
        POPULATION CHARACTERISTICS        October 19 thru October 30, 1970
**********************************************

CONTROL NO.     POPULTN   RES SVD   REQR SVD

 511002001.         2.      2141.      5864.
 511002002.         4.      1070.      5214.
 511005003.         8.       365.      1570.
 641007005.         7.      4583.     14604.
 641007014.         7.      4584.     14604.



******************************************************************************************************

                                        SUMMARY REPORT
                                                        October 19 thru October 30, 1970
******************************************************************************************************

CONTROL        PEOPLE S/WK  LOT OF POLT  WEIGHT/DAY   COST/DAY  RATIO PREP/PD  CTY GEN/P/C  COST/TON  C/PER SVD/WK  C/RES SVD/WK

 511002001.         5864.        21.00      14036.       215.          0.517          1.71     30.57          0.18          0.50
 511002002.         5214.        34.80      17015.       224.          0.756          2.33     26.34          0.21          1.05
 511005003.         1573.         6.00      23474.       103.          0.869          2.14      8.53          0.07          0.29
 641007005.        14604.       104.55      36431.       216.          0.498          1.41     11.87          0.06          0.19
 641007014.        14604.        74.27      36431.        46.          1.000          1.41      2.50          0.01          0.04
```

APPENDIX B

Equations used to convert input data to output data.

APPENDIX B

DETAILED VEHICLE-CREW REPORT

Consumable Cost Per Operating Hour in Dollars

Consumable cost per operating hour =

$$\frac{(\Sigma \text{consumable costs})\ (60)}{(\Sigma \text{minutes from pool to start of route + minutes driven collecting + minutes transporting})}$$

Crew Size

Crew size =

$$\frac{\Sigma \text{man days worked}}{\text{number of days worked}}$$

Hourly Rate in Dollars

Hourly rate =

$$\frac{\Sigma \text{ of hourly rate each day for period}}{\text{number of days of data in period}}$$

Work Hours Per Week

Work hours per week (hours worked per man per week while data was being collected) =

$$\frac{\Sigma \text{hours worked per man per day}}{\dfrac{(\text{number of days of data in period})}{(\text{number of days data collected on this route per week})}}$$

ROUTE CHARACTERISTICS REPORT

Length of Route Per Day in Miles

$$\text{Length of route per day} = \frac{\Sigma \text{ length of route each day}}{\text{number of days of data in period}}$$

Route Characteristics - Area Served in Square Miles

$$\text{Area Served} = \frac{\text{area served each day}}{\dfrac{(\text{number of days of data in period})\ (\text{collection schedule})}{(\text{number of days data collected on this route per week})}}$$

Average Weight Collected Per Day

$$\text{Average weight per day} = \frac{\Sigma \text{weight collected each day}}{\text{number of days of data in period}}$$

DETAILED ROUTE OPERATIONS REPORT

Distance from Motor Pool to Route in Miles

$$\text{Distance from pool to start of route} = \frac{\sum \text{miles from pool to start of route each day}}{\text{number of days of data in period}}$$

Time from Motor Pool to Route in Minutes

$$\text{Time from pool to start of route} = \frac{\sum \text{minutes traveling from pool to start of route each day}}{\text{number of days of data in period}}$$

Distance Driven During Collection in Miles

$$\text{Distance driven collecting} = \frac{\sum \text{miles driven collecting each day}}{\text{number of days of data in period}}$$

Time Spent Collecting in Minutes

$$\text{Time spent collecting} = \frac{\sum \text{minutes spent collecting each day}}{\text{number of days of data in period}}$$

Distance Driven Transporting in Miles

$$\text{Distance driven transporting} = \frac{\sum \text{miles driven transporting each day}}{\text{number of days of data in period}}$$

Time Spent Transporting in Minutes

$$\text{Time spent transporting} = \frac{\Sigma\,\text{minutes spent transporting each day}}{\text{number of days of data in period}}$$

Time for Collection Per Residence Served in Minutes

$$\text{Time to collect per residence served (per week)} = \frac{\dfrac{\Sigma\,\text{minutes spent collecting each day}}{\dfrac{(\text{number of days of data in period})\ (\text{collection schedule})}{(\text{number of days collected on this route per week})}}}{\text{number of residences served per week}}$$

Quantity Generated Per Residence Per Day in Pounds

$$\text{Quantity generated per residence per calendar day} = \frac{\Sigma\,\text{weight collected each day}}{\dfrac{(\text{number of days of data in period})\ (7)\ (\text{number of residences served per week})}{(\text{number of days collected on this route per week})}}$$

Quantity Generated Per Person Per Day in Pounds

$$\text{Quantity generated per person per calendar day} = \frac{\Sigma\,\text{weight collected each day}}{\dfrac{(\text{number of days of data in period})\ (7)\ (\text{number of people served per week})}{(\text{number of days collected on this route per week})}}$$

DETAILED ROUTE COST REPORT

(All values in dollars)

Cost to Travel to Route Per Day in Dollars

Cost to travel to route per day = (Cost of vehicle per operating minute + cost of crew per minute + maintenance cost per operating minute + consumable cost per operating minute) X average time from pool to start of route

Equipment Cost to Collect Per Day

Equipment cost to collect per day = (Cost of vehicle per operating minute + maintenance cost per operating minute) + consumable cost per operating minute) X average minutes driven collecting per day

Manpower Cost to Collect Per Day

Manpower cost to collect per day = Average crew wages per minute X average minutes spent collecting per day

Total Cost to Collect Per Day

Total cost to collect per day = [Equipment cost to collect per day] + [manpower cost to collect per day]

Shipment Cost to Transport Per Day

Equipment cost to transport per day = (Average cost of vehicle per operating minute + maintenance cost per operating minute + consumable cost per operating minute) X average minutes spent transporting per day

Manpower Cost to Transport Per Day

Manpower cost to transport per day = Average crew wages per minute X average minutes spent transporting per day

Total Cost to Transport Per Day

Total cost to transport per day = Equipment cost to transport per day + manpower cost to transport per day

Ratio of Productive Cost Per Day to Actual Cost Per Day

$$\text{Ratio} = \frac{\text{(Total productive cost per day)}}{\text{(Total actual cost per day)}} \qquad \text{(See below)}$$

Total Cost to Operate Per Day

Total productive cost of solid waste operation per day = Average cost to travel from pool to start of route per day + average cost to collect per day + average cost to transport per day

Total actual cost per day = Productive cost per day + (number of minutes crew paid per day - average minutes from pool to start of route per day - average minutes collecting per day - average minutes transporting per day) X cost of crew per minute

Cost Per Square Mile Per Week

Cost per square mile per week = (Total actual cost per day) X (number of days data collected on this route per week)
(Square miles contained in a weekly route)

COLLECTION ROUTE SUMMARY REPORT

People served $$= \frac{\Sigma \text{number of people served each day}}{\frac{(\text{number of days of data in period})\ (\text{collection schedule})}{(\text{number of days data collected on this route per week})}}$$

Length of Route in Miles

Length of route per week $$= \frac{\Sigma \text{length of route each day}}{\text{number of weeks of data in period}}$$

Weight Per Day in Pounds

Average weight per day $$= \frac{\Sigma \text{weight collected each day}}{\text{number of days of data in period}}$$

Cost Per Day in Dollars

Total productive cost of solid waste operation per day = Average cost to travel from pool to start of route per day + average cost to collect per day + average cost to transport per day

Total actual cost per day = Total productive cost per day + (number of minutes crew paid per day - average minutes from pool to start of route per day - average minutes collecting per day - average minutes transporting per day) X cost of crew per minute

Quantity Generated Per Person Per Day in Pounds

$$\text{Quantity generated per person per calendar day} = \frac{\Sigma\,\text{weight collected each day}}{\dfrac{(\text{number of days of data in period})\ (7)\ (\text{number of people served per week})}{(\text{number of days collected on this route per week})}}$$

Cost Per Ton in Dollars

$$\text{Average cost per ton} = \frac{(\text{average total cost per day})}{\dfrac{(\text{average weight in pounds per day})}{2000}}$$

Cost Per Person Served Per Week

$$\text{Cost per person served per week} = \frac{(\text{average total cost per day})\ \text{X}\ (\text{number of days collected})}{(\text{people served per week})}$$

Cost Per Residence Served Per Week

$$\text{Residences served} = \frac{\Sigma\ \text{number of residences served each day}}{\dfrac{(\text{number of days of data in period})\ (\text{collection schedule})}{(\text{number of days data collected on this route per week})}}$$

$$\text{Cost per residence served per week} = \frac{(\text{average total cost per day})\ \text{X}\ (\text{number of days collected})}{\text{residences served per week}}$$

APPENDIX C

INSTRUCTIONS FOR LOADING

DATA

The data received from the cooperating communities is inserted into the computer on punched cards. The following instructions were used to convert the information from the format in which it was received to the format in which it would appear on the punched cards.

The data received is transcribed to a general loading form.

The keypunch is done from the loading form. There are several versions of loading forms. A copy of the one used is included as Figure 1 of this Appendix.

The differences in the loading forms are in the administrative information which the form accommodates. Since this information is different on each version of the form and the required entry is obvious, no explanation is made as to what entry should be made.

The instructions concern themselves with the entries that should be made in the body of the form.

The Pilot Solid Waste Data Acquisition and Analysis System does not require any entries to be made in the Remarks Column of the body of the form. The numbers (1-80) listed across the top and bottom lines of the body of the form are the columns numbers referenced in the instructions. One line (80 columns) are filled out for each card and the system uses 3 cards for each days data for each route sampled. Columns 1 through 19 are the same for each of the cards in a given days data. The instructions pertaining the information to be entered in the columns will be shown under information common to all cards.

The instructions pertaining to the entries required in columns 20-80 are delivered on a card by card basis.

Information common to all ca (Columns 1 through 19 ind.)

Region Identification - Columns 1 and 2

Definition

The EPA region which encompasses the standard metropolitan area from which the data was taken.

Example:

The EPA region which encompasses Arkansas, Louisiana, Texas, Oklahoma and New Mexico.

Col. 1 2
0 6

SMSA Identification Columns 3 & 4

Definition

An area having an integrated economic and social structure and classified by the Bureau of Census as a standard metropolitan statistical area.

Example:

The area of Wichita, and Archer Counties in Texas.

Col. 3 4
8 1

City Identification (Columns 5, 6, and 7)

Definition

A series of numerical identifiers developed for the Pilot Solid Waste Data Acquisition and Analysis System to identify political entities from which information was gathered.

Example:

Burkburnett, Texas (see Table 1 this Appendix).

Col. 5 6 7
0 0 1

Route Identification (Columns 8, 9, and 10)

Definition

A series of numerical identifiers developed for the Pilot Solid Waste Data Acquisition and Analysis System to identify the routes from which the data was taken.

APPENDIX C TABLE 1

Burkburnett, Texas	0 0 1
Cleveland, Ohio	0 0 2
Iowa Park, Texas	0 0 3
Maitland, Florida	0 0 4
N. Olmstead, Ohio	0 0 5
Orlando, Florida	0 0 6
Wichita Falls, Texas	0 0 7
Wickliff, Ohio	9 9 9

Example:
The route in Burkburnett, Texas, which is serviced on Monday and Thursday and known as R.L.'s route.

Col. 8 9 10
0 1 1

Appendix F gives a complete index of the routes from which data was gathered showing their control number. The last three digits of the control number is the route number.

Julian Data Columns 12-16

Definition:
A five digit number showing the year and day of the operation which the data describes.

Example:
May 15, 1971

Col. 12 13 14 15 16
7 1 1 3 5

Card Number - Column 19

Definition:
The system requires three cards for the input of the data. This card number indicates which of these cards and consequently what data is being put into the space.

Example:
Card No. 1

Col. 19
1

The designations for the columns are as shown below:

CARD NO. 1

Crew Size - columns 20-22

Definition:
The total number of employees associated with the specific route on a given date.

Example:
1 driver and 4 laborers

Col.	20	21	22
			5

Hourly Rate - Columns 23-26

Definition:
Crew rate (average) in dollars and cents/hour.

Example:
1 driver @$4.37/hr, 4 laborers @$4.00/hr,
[($4.37+(4) $4.00)/5] = $4.07/hr

Col.	23	24	25	26
	4	.	0	7

Work Day - Columns 27-29

Definition:
Length of the work day in hours.

Example:
40 hour work week, over 5 days.

Col.	27	28	29
			8

Length of Route - Columns 30-34

Definition:
Length of route in miles/day.

Example:
3.9 mi/day

Col.	30	31	32	33	34
			3		9

Area Served - Columns 35-39

Definition:
Area in square miles served by the route per day.

Example:

0.88 miles long by 0.60 miles wide.
(round to nearest thousandth).

(.88 mi) x (.60 mi) = .528 sq mi

Col.	35	36	37	38	39
				5	3

Gross Weight - Load 1 - Columns 40-44

Definition:
Gross Weight 1st load.

Example:

31,920 lbs

Col.	40	41	42	43	44
	3	1	9	2	0

Gross Weight - Load 2 - Columns 45-49

Definition:
Gross Weight 2nd load.

Example:

30,080

Col.	45	46	47	48	49
	3	0	0	8	0

Gross Weight - Load 3 - Columns 50-54

Definition:
Gross weight 3rd load.

Example:

Only 2 loads for specific day.

Col.	50	51	52	53	54
	leave blank				

Dist. to Route - columns 55-

Definition:
Miles driven from pool to start of route per day.

Example:
4.2 miles

Col	55	56	57	58
		4		2

Time to Route - columns 59-62

Definition:
Time in minutes spent driving from the pool to the start of the route per day.

Example:
25 minutes

Col	59	60	61	62
			2	5

Dist. Driven Collect - columns 63-66

Definition:
Distance in miles driven to collect solid waste per day.

Example:
3.9 miles

Col	53	64	65	66
		3		9

Time Collect - columns 67-70

Definition:
Time in minutes spent collecting solid waste per day.

Example:
206 minutes

Col	67	68	69	70
		2	0	6

Cons. Cost Today - columns 71-75

Definition:
Consumable cost associated with vehicle - expressed in terms of cost per operating minute/day.

Example:

2.40/hr or .04/minute (2.40 ÷ 60)

Col	71	72	73	74	75
				0	4

CARD NO. 2

Dist. Xporting - Load 1 - columns 20-23.

Definition:
Distance in miles driven to transport solid waste to the disposal system per trip (round trip distance) 1st trip.

Example:	Col	20	21	22	23
4.2 miles			4		2

Dist. Xporting - Load 2 - columns 24-27.

Definition:
Distance in miles driven to transport solid waste to the disposal system per trip (round trip distance 2nd trip.

Example:	Col	24	25	26	27
4.2 miles			4		2

Dist. Xporting - Load 3 - columns 28-31.

Definition:
Distance in miles driven to transport solid waste to the disposal system per trip (round trip distance) 3rd trip.

Example:	Col	28	29	30	31
No 3rd trip.	leave blank				

Time Xporting - Load 1 - columns 32-34.

Definition:
Time in minutes spent transporting solid waste to the disposal system per trip (round trip time) 1st trip.

Example:	Col	32	33	34
74 minutes.			7	4

Time Xporting - Load 2 - columns 35-37.

Definition:
Time in minutes spent transporting solid waste to the disposal system per trip (round trip time) 2nd trip.

Example:	Col	35	36	37
85 minutes.			8	5

Time Xporting - Load 3 - columns 38-40.

Definition:
Time in minutes spent transporting solid waste to the disposal system per trip (round trip time) 3rd trip.

Example:
No 3rd trip.

Col	38	39	40
	lv blank		

Econ Level - columns 41-43.

Definition:
Economic level of the residence along the route (daily). Data by tenths.

Level in Tenths	Column	Code 41	42	43
1 lowest				1
2				2
3				3
4				4
5				5
6				6
7				7
8				8
9				9
10 highest				10

Example:
Specific area from census tract calls out 2 indicating 80% of the people in the county are economically better than that specific route.

Col	41	42	43
			2

No. of Residence Served - columns 44-48.

Definition:
Number of residences served by specific route per day.

Example:
248

Col	44	45	46	47	48
			2	4	8

No. of People Served - columns 49-53.

Definition:
Number of people served by specific route per day.

Example:
1,335

Col	49	50	51	52	53
		1	3	3	5

CARD NO. 3

Card 3 insertion indicator - Column 80 of Card 2

If a Card 3 is used, insert the number 1 in column 80 of Card 2.

Example:

Col	80
	1

Type Veh. - columns 20-22

Definition:
Type of vehicle used for collection.

Codes:
1 - front loader compactor
2 - side loader compactor
3 - rear loader compactor
4 - train

Example:
Front loader compactor.

Col	20	21	22
			1

Size Veh. - columns 23-25

Definition:
Size of vehicle used for collection - Cubic yard capacity.

16 cubic yards - 16
20 cubic yards - 20
25 cubic yards - 25
26 cubic yards - 26
21 cubic yards - 21
18 cubic yards - 18 (train)

Example:
16 cu yd packer truck

Col	23	24	25
		1	6

Age Veh. - columns 26-28.

Definition:
Age of collection vehicle - years.

Example:
10 years

Col	26	27	28
		1	0

Vehicle Life Expectancy in Op. Hours - columns 29-37.

Definition:
Life expectancy of the vehicle in operating hours.

Example:
Life expectancy,
5 yr @40 hr/wk = 10,400 hrs

Col	29	30	31	32	33	34	35	36	37
					1	0	4	0	0

NOTE: This item should be completed on first submission only, then subtracted by the computer for subsequent entries.

Cost of Vehicle in Dollars - columns 38-46.

Definition:
Cost of the vehicle in dollars.

Example:
$18,000

Col	38	39	40	41	42	43	44	45	46
					1	8	0	0	0

Maint Cost/Op. Min. - columns 47-51.

Definition:
Maintenance cost associated with vehicle - expressed in terms of cost per operating minute.

Example:
$0.90/hr or $.015/minute -(.90 ÷ 60.)

Col	47	48	49	50	51
			0	1	5

Type Serv. - columns 52-55.

Definition:
Type of service provided on the route for specified day.

Code: 1 - curb pick-up
2 - yard pick-up
3 - alley pick-up

Example:	Col	52	53	54	55
Curb pick-up					1

Disp. Point - columns 56-59.

Definition:
Type of system that the route uses to dispose of waste after it has been collected on specific day.

Code: 1 - transfer station
2 - landfill
3 - incinerator

Example:	Col	56	57	58	59
Transfer station.					1

Collect. Sched. - columns 60-63.

Definition:
Collection schedule for route.

1/week - 1
2/week - 2
4/week - 4

Example:	Col	60	61	62	63
1/week					1

Sep. - columns 64-67.

Definition:
Separation is required or not required for specified day.

Code: 1 - Separation not required.
2 - Separation requried.

Example:	Col	64	65	66	67
Separation not required.					1

Vehicle Wt. (Tare) - columns 68-73.

Definition:

Weight of vehicle in pounds.

Example:
20,460 lbs

Col	68	69	70	71	72	73
		2	0	4	6	0

APPENDIX D

WICHITA FALLS DATA PACKAGE

```
                                      ASSIGNMENT AND COST SUMMARY FOR********
                                                    BY ROUTE

                                                                   REG.     OVER      GAS       OIL     REPAIR    MAINT.     TOTAL
ROUT              EMPLOYEES                      EQUIPMENT          PAY      PAY     COSTS     COSTS     COSTS     COSTS     COSTS
***  ***** ***** ***** ***** *****    **** **** **** **** ****  *******   ******   ******   *******   *******   *******  ********

220   2425     0     0     0     0    3406    0    0    0    0  $ 22. 5   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  22. 5
221    669     0     0     0     0    3407    0    0    0    0  $ 23.13   $ 5.14   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  28.27
222    697     0     0     0     0    3403 3410    0    0    0  $ 23.13   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  23.13
223    704     0     0     0     0    3404 3409    0    0    0  $ 23.13   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  23.13
224    738     0     0     0     0    3408    0    0    0    0  $ 23.13   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  23.13
236    633   665  3023     0     0    3000 3100 3101 3102 3300  $ 55.71   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  55.71
237    752  2858  4334     0     0    3001 3103 3104 3105 3301  $ 54. 0   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  54. 0
238   2393  2356     0     0     0    3002 3106 3107 3108 3302  $ 36.36   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  36.36
239    748  2653  4190     0     0    3003 3109 3110 3111 3303  $ 54.72   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  54.72
240    698  1675  2391     0     0    3004 3112 3113 3114 3304  $ 56.43   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  56.43
241   1310  2385  4195     0     0    3005 3115 3116 3117 3305  $ 55.71   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  55.71
242    692  2054  2841     0     0    3006 3118 3119 3120 3306  $ 57.42   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  57.42
243    753  4141  4182     0     0    3007 3121 3122 3123 3307  $ 54. 0   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  54. 0
244   1128  1934     0     0     0    3008 3124 3125 3126 3308  $ 38.25   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  38.25
245    672  2598     0     0     0    3009 3127 3128 3129 3309  $ 39.24   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  39.24
246    720  2021  4165     0     0    3010 3130 3131 3132 3310  $ 55.71   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  55.71
247    676  3080  3082     0     0    3011 3133 3134 3135 3311  $ 55.62   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  55.62
248    664  1529  4117     0     0    3012 3136 3137 3138 3312  $ 55.71   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  55.71
249    645   717   741  3084     0    3013 3139 3140 3141 3313  $ 74.70   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  74.70
250    723  1546     0     0     0    3014 3142 3143 3144 3314  $ 39.24   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  39.24
251    739  2354  2509     0     0    3015 3145 3146 3147 3315  $ 55.44   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  55.44
252   2149  2696     0     0     0    3017 3148 3149 3150 3319  $ 36.36   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  36.36
253    715  1128     0     0     0    3018 3151 3152 3153 3320  $ 39.24   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  39.24
254    707  2356  2471     0     0    3019 3154 3155 3156 3321  $ 57.42   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  57.42
255   2066  2811  4192     0     0    3020 3157 3158 3159 3322  $ 54.72   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  54.72
277    669   743  2131     0     0    3455    0    0    0    0  $ 57.42   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  57.42
282    708   709  4146     0     0    3460    0    0    0    0  $ 58.59   $ 0. 0   $ 0. 0   $  0. 0   $  0. 0   $  0. 0  $  58.59

                                                                *******   ******   ******   *******   *******   *******  ********

                                      TOTALS                    1256.58     5.14     0. 0      0. 0      0. 0      0. 0   1261.72
```

```
TRAIN   240   MOTHER TRUCK  3407                                              MOTHER TRUCK ROUTE NUMBER 221
ROUTES  241   EMPLOYEE       669
        242                                                                              MONDAY, 19 APR 71
        243

                                   **********   COLLECTION DATA   **********

AVERAGE        COLLECTION         TOTAL NUMBER OF       LAND FILL SITE 1      LAND FILL SITE 2        TOTAL
WEATHER         TIME IN          CONTAINERS DUMPED      ----------------      ----------------        WEIGHT
CODE            MINUTES          -----------------      WEIGHT    NUM OF      WEIGHT    NUM OF      COLLECTED
                                 FIXED       TRAIN     %POUNDS□   CNTNRS     %POUNDS□   CNTNRS      %POUNDS□

  2.0             649               40          72           0         0        76220        99         76220

                                      **********   COST DATA   **********                          COST PER
                                                                                         TOTAL     100 POUNDS
 GAS       UIL      SUPPLIES      REPAIRS      PERSONNEL      OVERHEAD     DEPRECIATION      COST      COLLECTED

 0.0       0.0        0.0           0.0          28.27          2.26           14.70         45.23         0.06
#########################################################################################################
EQUIPMENT  3004   EMPLOYEES       698                                                   TRAIN ROUTE NUMBER 240
           3112                  1675
           3113                  2391
           3114
           3304

                                  **********   COLLECTION UATA   **********
                                                                                 LAND USE DATA  %BY ACTIVITY□
NODE   TIME  WTHR  WEIGHT   DISTANCE     COLLECTION   CENTROIDS       PARCELS     ----------------------------------
       OF    CODE  %LBS□    %MILES□       TIME IN    --------------  -----------   ACT.   TOTAL   NUM  NUM  NUM    FLOOR
       DAY                  COLL  NON-C   MINUTES    FIRST LAST NUM  NUM   AREA    CODE   AREA    PAR  EST  RES     AREA

31600  0909  2     2883     1.2   0.3       129      3098 4056  8    75  798660    1000  784835   73   86   86   137767
                                                                                   4000    9425    1   39    6     4771
16248  1056  2     3201     1.1   2.3       107      4025 6648 10    59  760761    9000    4400    1    1    0        0
                                                                                   1000  760761   59   60   62   108348
14855  1230  2     1530     0.6   0.2        94      6701 6925  5    26  445676    4000       0    0   16    0     1394
                                                                                   6000   14940    1    2    0      400
                                                                                   1000  430736   25   39   54    64470
                                                                                   4000       0    0    5    0      288

                                  %CONTINUED ON NEXT PAGE□
```

```
                                                                                                   MOTHER TRUCK ROUTE NUMBER 221
                                                                                                                %CONTINUED¤
                                                                                                           MONDAY, 19 APR 71

                                   **********  COLLECTION DATA   **********
 NODE   TIME  WTHR  WEIGHT   DISTANCE     COLLECTION   CENTROIDS       PARCELS        LAND USE DATA  %BY ACTIVITY¤
        OF    CODE  %LBS¤    %MILES¤      TIME IN    --------------  -----------   ------------------------------------
        DAY                 COLL  NON-C   MINUTES    FIRST LAST NUM  NUM    AREA   ACT.   TOTAL   NUM  NUM  NUM    FLOOR
                                                                                   CODE   AREA    PAR  EST  RES     AREA
 17983  1412   2     2914   1.4   0.8        102     6939 6732 13    55  1295326   1000  921046   44   59   93   115832
                                                                                   6000       0    0    1    0      600
                                                                                   4000       0    0    1    0        0
 15133  1454   2     1398   0.5   0.3         42     6794 7038  5    37   337690   9000  374280   11   11    0        0
                                                                                   1000  337690   37   37   37    44445
                                                                                   4000       0    0    2    0     1053
 15147  16/3   2     3124   1.7   0.6         89     7198 7119 12    93   941290   6000       0    0    1    0     1050
                                                                                   1000  941290   93   93   93   103843
                                                                                   4000       0    0    1    0        C

 *** TOTALS ***      15050   6.5   4.5   563     0    3098 7119 53   345  4579403                  431

                                     **********   COST DATA    **********
   GAS        OIL       SUPPLIES       REPAIRS       PERSONNEL      OVERHEAD    DEPRECIATION     TOTAL        COST PER
                                                                                                 COST       100 POUNDS
                                                                                                             COLLECTED
   0.0        0.0         0.0            0.0           56.43          5.53           2.40         64.36         0.43
-------------------------------------------------------------------------------------------------------------------------
 EQUIPMENT  3005  EMPLOYEES      1310
            3115                 2385                                                        TRAIN ROUTE NUMBER 241
            3116                 4135
            3117
            3.05

                                   **********  COLLECTION DATA   **********
 NODE   TIME  WTHR  WEIGHT   DISTANCE     COLLECTION   CENTROIDS       PARCELS        LAND USE DATA  %BY ACTIVITY¤
        OF    CODE  %LBS¤    %MILES¤      TIME IN    --------------  -----------   ------------------------------------
        DAY                 COLL  NON-C   MINUTES    FIRST LAST NUM  NUM    AREA   ACT.   TOTAL   NUM  NUM  NUM    FLOOR
                                                                                   CODE   AREA    PAR  EST  RES     AREA
 35615  0921   2     3474   1.3   0.7        141     3103 3201  9    44   659444   1000  781400   43   60   60   125596
                                                                                   4000       0    0    5    2      240
                                                                                   6000   78044    1    1    0        0
                                        %CONTINUED ON NEXT PAGE¤
```

150

```
                                                                                                  MOTHER TRUCK ROUTE NUMBER 221
                                                                                                               %CONTINUED□
                                                                                                         MONDAY, 19 APR 71

                                  **********  COLLECTION DATA  **********
                                                                                   LAND USE DATA  %BY ACTIVITY□
NODE   TIME  WTHR  WEIGHT   DISTANCE     COLLECTION   CENTROIDS        PARCELS     -----------------------------------
        OF   CODE  %LBS□   %MILES□      TIME IN    --------------  -----------    ACT.    TOTAL   NUM  NUM  NUM    FLOOR
       DAY                 COLL  NON-C   MINUTES   FIRST LAST NUM   NUM    AREA    CODE    AREA    PAR  EST  RES    AREA

31662  1042   2     2463   1.4   0.5          81   3120 6129 11     51  1108917    1000  1021477   45   60   60   152902
                                                                                   4000    35800    2   13    4     3243
                                                                                   6000        0    0    2    0      710
                                                                                   7000    20000    1    1    0      300
                                                                                   9000    31640    3    3    0        0
14757  1205   2     3210   1.9   1.7          83   3568 6827 15     96  2517748    1000  1957928   85   87   87   177367
                                                                                   6000    33700    1    1    0      168
                                                                                   9000   526120   10   10    0        0
                                                                                   4000        0    0    6    0      840
14886  1401   2     2713   1.6   0.8         116   6830 7265 12    116  1204766    1000   969330  103  103  103   141087
                                                                                   6000    81736    3    5    1     9840
                                                                                   9000   107900    8    8    0     2245
                                                                                   4000        0    0    2    0        0
                                                                                   5000    45800    2    2    0     5193
15374  1505   2     2082   2.3   0.7          64   7315 7475 26    113  1317707    1000  1307257  112  112  112   143961
                                                                                   4000        0    0    3    0      800
15200  1609   2     1108   0.5   0.0          64   7234 7377  4     26   247670    9000    10450    1    1    0        0
                                                                                   1000   247670   26   26   26    31811
*** TOTALS ***     15050   9.0   4.4   549     0   3103 7377 77    446  7256252
                                                                                                    455

                                  **********  COST DATA  **********
                                                                                                                COST PER
                                                                                                   TOTAL       100 POUNDS
  GAS        OIL      SUPPLIES     REPAIRS     PERSONNEL     OVERHEAD     DEPRECIATION      COST        COLLECTED

  0.0        0.0        0.0          0.0         55.71          5.46          2.39           63.56          0.42
-----------------------------------------------------------------------------------------------------------------------
```

%CONTINUED ON NEXT PAGE□

```
EQUIPMENT  3006  EMPLOYEES        692                                                                  TRAIN ROUTE NUMBER 242
           3118                  2054
           3119                  2841
           3120
           3306

                                  **********   COLLECTION DATA   **********
                                                                                         LAND USE DATA  %BY ACTIVITY¤
   NODE  TIME WTHR WEIGHT  DISTANCE      COLLECTION  CENTROIDS         PARCELS      -----------------------------------------
         OF   CODE %LBS¤   %MILES¤        TIME IN   --------------   ------------   ACT.    TOTAL  NUM  NUM  NUM     FLOOR
         DAY               COLL  NON-C    MINUTES   FIRST LAST NUM   NUM     AREA   CODE     AREA  PAR  EST  RES      AREA

  35629  0940  2    3104   1.8   0.7         160    3411 3750  8     63  2033006    1000  1640118   57   91   91    216583
                                                                                    4000        0    0   11    0      1704
                                                                                    9000   392888    6    6    0         0
                                                                                    6000        0    0    2    0       75?
  11664  1111  2    2284   1.6   1.6          91    3733 8044 10     58  1985690    1000  1643778   54   57   57    134486
                                                                                    4000        0    0    8    1      3491
                                                                                    6000        0    0    3    1      1392
                                                                                    9000   341912    4    4    0         0
  16475  1221  2    3123   0.9   0.4          70    8237 7959 12     58   531975    1000   531975   58   58   57     95359
  14872  1350  2    2573   2.5   0.7          89    8030 7489 13    129  1612625    1000  1211331  114  116  114    178767
                                                                                    0000     7700    1    1    1         0
                                                                                    9000   393594   14   18    0      2560
                                                                                    4000        0    0    1    0         0
                                                                                    6000        0    0    1    0      1834
  25742  1511  2    2121   1.0   1.6          81    1019 1084  8     73   545810    1000   545810   73   73   73     68790
  25756  1614  2    1780   1.3   0.9          63    1151 1294 11     79   606017    1000   606017   79   79   79     75212

  *** TOTALS ***   14985   9.1   5.9   554     0     3411 1294 62    460  7315123                          474

                                   **********   COST DATA   **********                              COST PER
                                                                                         TOTAL      100 POUNDS
   GAS        OIL       SUPPLIES      REPAIRS     PERSONNEL     OVERHEAD    DEPRECIATION     COST      COLLECTED

   0.0        0.0         0.0          0.0          57.42         5.62          2.39        65.43        0.44
-------------------------------------------------------------------------------------------------------------------------------

EQUIPMENT  3007  EMPLOYEES        753                                                                  TRAIN ROUTE NUMBER 243
           3121                  4141
           3122                  4182
           3123
           3307

                                  **********   COLLECTION DATA   **********
                                                                                         LAND USE DATA  %BY ACTIVITY¤
   NODE  TIME WTHR WEIGHT  DISTANCE      COLLECTION  CENTROIDS         PARCELS      -----------------------------------------
         OF   CODE %LBS¤   %MILES¤        TIME IN   --------------   ------------   ACT.    TOTAL  NUM  NUM  NUM     FLOOR
         DAY               COLL  NON-C    MINUTES   FIRST LAST NUM   NUM     AREA   CODE     AREA  PAR  EST  RES      AREA

  27384  0931  2    2439   1.8   1.1         151    1786 3652 14     55  1341035    1000  1211715   48   64   64    186683
                                                                                    4000    37000    1    7    2      2003
                                                                                    5000    18000    1    1    0      1960
                                                                                    9000    74320    5    6    0       530
                                                                                    6000        0    0    4    0      1356

                                         %CONTINUED ON NEXT PAGE¤
```

152

```
                                                                                     MOTHER TRUCK ROUTE NUMBER 221
                                                                                                   %CONTINUED¤
                                                                                           MONDAY, 19 APR 71

                                    **********   COLLECTION DATA   **********
                                                                              LAND USE DATA  %BY ACTIVITY¤
NODE   TIME  WTHR  WEIGHT   DISTANCE     COLLECTION   CENTROIDS      PARCELS      ------------------------------------
       OF    CODE  %LBS¤    %MILES¤      TIME IN    --------------  -----------   ACT.   TOTAL    NUM  NUM  NUM    FLOOR
       DAY                  COLL  NON-C  MINUTES    FIRST LAST NUM  NUM   AREA    CODE   AREA     PAR  EST  RES     AREA

11342  1126  2     2403     1.9   2.7        115    3537 8352 15    82  1651148   1000  1291273   68   68   68   157878
                                                                                  9000   331075   13   15    2      669
                                                                                  6000    28800    1    1    0      150
                                                                                  4000        0    0    6    3     1275
12121  1332  2     3394     1.2   0.7        126    8349 7881  8    74   806500   1000   799000   73   74   74   109738
                                                                                  4000        0    0    2    0      520
                                                                                  6000        0    0    1    0      252
                                                                                  9000     7500    1    1    0        0
25742  1525  2     2707     2.4   3.9        113    7816 1120 20   121  1984207   1000  1497299   99  102  102   144792
                                                                                  9000   361760   17   20    2     1606
                                                                                  4000    13020    1    7    2        0
                                                                                  5000    99328    3    5    0     6346
                                                                                  6000    12800    1    3    0     2676
25594  1638  2     3419     1.4   0.9         73    1263 1280 17   115   833450   1000   809050  105  105  105   110008
                                                                                  9000    74400   10   10    0        0
                                                                                  4000        0    0    1    1        0

*** TOTALS ***     14362.   8.7   9.3   578    0    1786 1280 74   447  6666340                            425

                                      **********   COST DATA   **********
                                                                                             TOTAL        COST PER
                                                                                                       100 POUNDS
 GAS      OIL     SUPPLIES     REPAIRS     PERSONNEL     OVERHEAD     DEPRECIATION      COST       COLLECTED

 0.0      0.0       0.0          0.0         54.00         5.29            2.40          61.69          0.43

------------------------------------------------------------------------------------------------------------------
```

APPENDIX E

Instructions for Converting Wichita Fall Data for Use With the Pilot Solid Waste Data Acquisition and Analysis System.

APPENDIX E

Instructions for Converting Wichita Falls Data

General

The data pertaining to the Solid Waste Operation in Wichita Falls, Texas, is received in packages like that shown in Appendix D. One such package covers the operation of mother truck 3406 and its associated trains for one day and a separate package covers the operation of mother truck 3407 and its associated trains. The date of operation which the data covers is shown on page 149, the top line the top right hand corner.

The data is received in packages covering one mother truck and four trains for one day. The packages must be kept intact, grouped by mother truck number and in date sequence for orderly processing.

Following are the data elements and the method for obtaining them.

Data Element 1- Crew Size

Method

Locate the sheet entitled, "Assignment and Cost Summary by Route"(Page 148 in Appendix D). In Column 1, locate the route number for the mother truck and the trains.

Mother truck 3406 covers route 220 and mother trains which cover routes 236, 237, 238, 239. Mother truck 3407 covers route 221 and mothers routes 240, 241, 242, 243.

To determine the crew size for mother truck 3407 and its associated trains, count the entries that are not zeros in Columns 2, 3, 4, 5 and 6. (An entry may have as many as four digits) which are opposite route numbers 221, 240, 241, 242,

243. Each entry represents one crew member. The number of entries is the crew size. This number is entered in columns 21 and 22 of the loading form on the entry for card one on the date specified.

This instruction and all those to follow will apply to mother truck 3407 and its associated trains. All instructions apply to 3406 and its associated trains. The only difference being the numbers used.

Data Element 2 - Hourly Rate

Method

Locate the sheet entitled "Assignment and Cost Summary by Route" (Page 148 in Appendix D). Locate the desired route number in column one (i.e., 221, 240, 241, 242, and 243). Opposite these route numbers in the column headed, "Regular Pay" Column 12, locate the pay for that day (i.e., 23.13, 56.43, 55.71, 57.42, 54.00). Add the numbers obtained from Column 12 and divide it by 8 times the crew size determined above. Enter this quotient including the decimal in column numbers 23, 24, 25, and 26 on the card 1 entries for the correct Julian date.

Data Element 3 - Work Day

Method

The Wichita Falls work day is 8.0 hours. Enter this in Columns 27, 28, 29 opposite the card 1 entry for the applicable Julian date.

Data Element 4 - Length of Route

Method

The route lengths for the Wichita Falls Routes are not given in the data package. However, they were measured from route maps and are listed below.

Day	Length of 3407 Route	Length of 3406 Route
Monday	57.0 miles	78.5 miles
Tuesday	52.0 miles	64.4 miles
Thursday	57.0 miles	78.5 miles
Friday	52.0 miles	64.4 miles

Enter the appropriate number including the decimal in Columns 31, 32, 33 and 34 opposite the applicable Julian date on the Card 1 entry.

Data Element #5 Area Served

Method

The area served by the mother truck is the sum of the areas served by the trains. It is shown by train route on pages 149 through 153 inclusive under the heading "Land Use Data". A check revealed that the data was constant for any given day of the week. Therefore, a table was developed and used. The values are listed below:

Day	3407 Area	3406 Area
Monday	.934 sq. miles	2.21 sq. miles
Tuesday	.803 " "	1.04 " "
Thursday	.934 " "	2.21 " "
Friday	.803 " "	1.04 " "

Enter the appropriate number including decimal in Columns 36, 37, 38 and 39 opposite the applicable Julian date on the card and entry.

Data Element #6 Gross Weight Collected

Method

The total weight of the waste collected for a mother truck and four trains is the sum of the weights collected by the four trains. It is shown by train route number on lines headed, "Totals", on pages 16, 17, 18 and 19 under Column 3. Sum these numbers and add 15,000 to the total to account for vehicle weight. Divide the grand total by 3 and round to the nearest whole 5 digit number. Enter this value in Column numbers 40, 41, 42, 43, and 44 and repeat it in Columns 45 through 49 inclusive and also in Columns 50 through 54 inclusive, opposite the appropriate Julian date on the Card 1 entry.

Data Element-7 Distance to Route

Method

These distances were determined by map measurements and are listed below:

Day	Distance to Route 3407	Distance to Route 3406
Monday	8.8	30.
Tuesday	5.1	30.
Thursday	8.8	30.
Friday	5.1	30.

The entries above represent the total distance traveled by all vehicles to reach the route.

Select the appropriate number from the above list and enter it including the decimal in Columns 56, 57, and 58 opposite the applicable Julian date on the card 1 entry.

Data Element - 8 Time to Route

Method

A table was developed for the average time to the route. The values are listed below:

Day	Time to Route 3407	Time to Route 3406
Monday	24.0	26.7
Tuesday	29.0	23.6
Thursday	24.0	26.7
Friday	29.0	23.6

Pick the appropriate number and enter it, including the decimal, in Columns 59, 60, 61 and 62 opposite the appropriate Julian date on Card 1.

Data Element-9 Distance Driven Collecting

Method

This is the same value as length of route. Repeat the entries made in Columns 31, 32, 33 and 34 of Card 1 in Columns 63, 64, 65 and 66 of Card 1.

Data Element 10- Time Collecting

Method

Locate the collection data sheets (Pages 149 thru 153) in Appendix D. Under each of the train routes obtain the entry from Column 6 entitled, "Collection Time in Minutes" from the line entitled "Total". Sum these numbers for the four train routes and divide the sum by 4. Enter the quotient in Columns 68, 69 and 70, opposite the applicable Julian date on Card 1.

Data Element-11 Consumable Cost Today

Method

Locate the sheet entitled "Assignment and Cost Summary by Route". Locate the applicable route numbers in Column 1. Obtain the costs listed under the columns headed Gas Costs and Oil Costs. Sum these numbers for all routes. Divide this sum by 8 and enter the quotient including decimal in Columns 72, 73, 74 and 75. Enter the quotient as dollars and cents (i.e., 2 digits to the right of the decimal).

Data Element-12 Distance Xporting

Method

The distance transporting was measured from maps. The distance include the trips between trains, the trips to the landfill and the return to the motor pool. The values used were the average of 30 measurements,they are listed below. The total travel distance was divided by those and entered as if it were done in three loads. Actually, as many as nine loads were made.

Day	Route of 3407	Route of 3406
Monday	9.8/load	14.8
Tuesday	18.1/load	14.8
Thursday	9.8/load	11.7
Friday	18.1/load	9.6

Enter the appropriate number in Columns 20, 21, 22, 23 and repeat them in Columns 24, 25, 26, and 27 and also in 28, 29, 30 and 31 opposite the applicable Julian date on the Card 2 entry.

Data Element-13 Time Xporting

Method

The time entered for transporting was 160 for each load. This was derived by dividing 480 minutes (8 hours) by 3 the number 7 trips to which all this data was normalized.

Enter the constant value 160 in Columns 32, 33, and 34 and repeat them in 35, 36, and 37 and again in 38, 39, and 40 opposite the appropriate Julian date for the Card 2 entry.

Data Element 14- Number of Residences Served

Method

The number of residences served was obtained from the collection data sheets (Pages 149 thru 153 inc., of Appendix D). From the section entitled "Land Use Data" under the column headed "$\frac{\text{Num}}{\text{Res}}$".

Sum the information in this column and enter it in Columns 44, 45, 46, 47 and 48 of the loading form opposite the appropriate date on the Card 2 entry.

Data Element-15 Number of People Served

Method

The value of this data element was determined by multiplying the number of residences served by 3.23 which is the average number of persons per family in the Wichita Falls area.

Enter the value obtained in Columns 49, 50, 51, 52 and 53 opposite the appropriate Julian Data on the Card 2 entry.

All the remaining data elements were obtained from the constant data on the form shown in Figure 2 of the text.

APPENDIX F

INDEX OF ROUTES

0478004007	Maitland, Florida	Nov, 1970
0478004008	Orange County, Florida	Dec, 1970
0478004009	Orlando, Florida, Route 2	Mar, 1971
0478004010	Orlando, Florida, Route 3	Mar, 1971
0511002001	Cleveland, Ohio, Garbage-2	Nov. 1970
0511002002	Cleveland, Ohio, RE-6	Nov, 1970
0511005003	North Olmstead, Ohio, Bretton Ridge Area	Nov, 1970
0511999004	Wickliffe, Ohio	Nov, 1970
0681001011	Burkburnett, Texas	Nov, 1970
0681003012	Iowa Park, Texas	Nov, 1970
0681007005	Wichita Falls, Texas, train	Nov, 1970
0681007013	Wichita Falls, Texas, packer	Nov, 1970
0681007006	Wichita Falls, Texas, train	Nov, 1970
0681007014	Wichita Falls, Texas, packer	Nov, 1970

Route Description fo Cleveland Garbage-2 Route 0511002001

This route is located immediately southwest of downtown Cleveland. The houses in this area are, for the most part, two-story wooden frame buildings. They are from 75 to 100 years old, occupied by first generation Americans. The route is no longer contiguous. It has been separated by the removal of many of the houses to make room for the expressways.

One of the most important points about the route is the fact that it services a group of 150 to 175 housing units that are owned and operated by the county. The waste is collected from these units by their crew and vehicle one day a week. Two other crews and vehicles also service it on two other days each week.

The occupants of these units are low-income people whose living is subsidized from county welfare funds.

The crew and vehicle serve a total of approximately 2,000 residences, housing almost 6,000 people. Pickup is made once each week. Alley pickup is the predominant mode.

The houses, other than the public housing area described, appear to house single families. The route is approximately 7 to 10 miles long. It is located about 6 miles from the Ridge Avenue Incinerator and approximately 9 to 12 miles from the land fill.

Cleveland Route RE-6 0511002002

This route is located 3 to 4 miles southwest of downtown Cleveland. The houses served are large two- and three-story wooden frame buildings, approximately 75 to 100 years old. Many of the houses have been remodeled to accommodate several families. The occupents are a combination of young people with young families and middle-aged people with children in their late teens. In many cases, several houses occupy a single lot. The lots are 40 to 50 feet wide and 150 feet deep. There are approximately 1,070 of these residences which house 5,214 persons. For the most part, collection is made from the alley, but there are several places where collection is made from the curb. Collection is made once each week. The areas serviced are located approximately 3 miles from the incinerator and approximately 5 to 6 miles from the landfill.

North Olmstead Route 0511005003

This route lies in the southwest portion of the city of North Olmstead. North Olmstead is contiguous to and southwest of the city of Cleveland. The area is known as Bretton Ridge. It is made up of houses that are approximately 5 years old. The residents are families with children of all ages. The lots are large. The homes are two-story combination brick and frame. This route was sampled on only one day per week. On that day, it served 365 residences, which housed approximately 1570 people. For some reason, unknown to the author, there were frequent occasions when the crew and vehicle picked up from 125 to 175 additional residences. All collections were curbside. The route covered approximately 6 miles and always discharged at the landfill, which was approximately 8 to 10 miles east of the route.

Wickliffe, Ohio, Route 0511999004

This route is located in the town of Wickliffe, which borders the northeast limit of the city of Cleveland. It is serviced by Bradbury Associates, a private contractor. There is very little information available on this route, as the original agreement was made to cover another area. The route services 537 residences, which house 2,128 people. Collection is made once a week. The collected waste is discharged at a landfill, which is approximately 12 to 15 miles southwest of the route.

Wichita Falls, Texas, Routes 0681007005, 0681007013, 0681007006, and 0681007014

These routes are located southeast of the business section of the city of Wichita Falls. The routes in Wichita Falls are different from the other routes, in that they use a combination train and packer system to serve the area. A train consists of a pickup truck with a 3-yard container mounted in the bed and 3, 5-yard containers that are towed behind the pickup truck. Eight of these trains travel through the various residential areas and collect the household waste. The waste generated inside the house is collected twice a week on either Monday and Thursday or Tuesday and Friday. On Wednesday, the yard waste is collected.

One 26-yard packer services four such trains. The packer is notified via radio when the train is loaded. The packer travels to the train and assimilates his load. This occurs as many as nine times a day for each train. As the packer becomes loaded, it goes to the landfill and discharges its load.

For purposes of the data acquisition and analyzis system, four trains and their associated crews were viewed as one collection vehicle. All information pertaining to vehicle cost, crew size, miles driven, etc., was derived, considering the four trains as one collection unit.It was further arbitrarily decided to assign the collection trains zero distance for transporting, and the packer zero distance for hauling.

Thus, it was necessary to assign one route numbers to each packer and another to the four trains. The city has eight trains and two packers that operate as two systems. The systems are identified by the number assigned to the packer vehicle. The two operating routes are known as 3406 and 3407.

The houses on the 3406 route vary from mostly single-story wooden frame asbestos shingle structures, to new brick development-type individual homes typical of the middle-income group, with a few large two-story frame houses scattered throughout the route.

The single-story wooden frame asbestos shingle houses are reminiscent of those built early in the World War II years. They seem to be occupied by older people. The lots are narrow (60 to 70 feet) but long (175 to 200 feet).

The development houses are relatively new on lots somewhat smaller, approximately 70 feet wide and 125 to 150 feet long. They seem to be occupied by well-established families with several children ranging up to middle teenagers.

The two-story frame houses are so few that they need not be considered.

The 3407 route is divided on Monday and Thursday; it serves a very affluent area. The houses range from upper to middle to high income. For the most part, they are two-story masonry structures that appear to be 10 to 15 years old. The lots are 85 to 100 feet wide and approximately 150 feet deep. Most are well landscaped with abundant shrubbery. On Tuesday and Friday, the route services an area where the houses are more modest. They are predominantly one-story masonry houses on lots 70 to 80 feet wide and 150 to 175 feet long.

The 3406 route services a total of 4,612 residences, which house approximately 15,000 people, while the 3407 route serves 4,941 residences, which house approximately 16,000 people.

The 3406 route operates in areas that are approximately 3 to 5 miles from the landfill, and the 3407 route operates in areas that are approximately 2 to 3 miles from the landfill.

Burkburnett, Texas, Route 0681001011

The route sampled in Burkburnett is unique, in that it services approximately one-half of the perimeter of the town. In so doing, it serves every economic class that can be sampled. Collection was made and data was gathered on this route for two days a week. The same area was covered both times. Collection was made from approximately 380 residences, which house 1,200 people.

The route is 8 to 10 miles long and requires a 3- to 4-mile trip to the landfill. The vehicle that services the route is one of three operating in the city.

The collection was made from both the alley and the curbside. The population from which the waste was collected is, in general, engaged in either the oil industry, ranching, or working at Sheppard Air Force Base.

Iowa Park, Texas, Route 0681003012

The route in Iowa Park is in the northwest corner of the town, approximately 2 miles from the business district. It consists of a very homogeneous group of

318 homes, which house 1,100 people. The houses are predominantly brick construction. The residents appear to be a cross section in age from newlyweds to families with grown children. Collection is predominantly from the alley, with several collections made at the curbside. Collections are made on Wednesday, using one truck for a full day, and on Saturday, using two trucks for approximately half a day. The area is 5 to 8 miles from the landfill. For the most part, the residents are supported by ranching, the oil industry, or work at Sheppard Air Force Base.

Disposal is always made at a landfill, which consists of pits that have been excavated in order to obtain fill dirt for the streets and other construction. The city operates two trucks.

Information was collected for only two days from this route. The vehicle covered the same area both days.

Maitland, Florida, Route 0478006007

Maitland is unique, in that it does not have a business section. It is predominantly a residential area. The residents work in either Orlando or Winter Park. The route on which data was collected is serviced three times a week, on the basis that wet waste would be collected on Monday and Thursday or Tuesday and Friday and paper and yard waste would be collected on Wednesday. Collections are made at the back door. The houses are one-story concrete block structure, which are well landscaped with semitropical shrubbery and citrus trees. The neighborhood is very homogeneous, having been developed in the last 15 years. Information was obtained for four days each week. The routes services 521 residences housing approximately 1,400 people on Monday and Thursday, and 457 residences housing 1,200 people on Tuesday and Friday. Wednesday is reserved for collecting paper and yard waste. The collection is so arranged for economic reasons, since the paper and yard waste can be discharged at a private landfill for approximately one-third the cost of using the county landfill. A set of portable scales were used to weigh the vehicles. The weights obtained and the volume estimated make the weights extremely questionable.

Central Services, Orlando, Route 6 0478004008

The route operates about 3 to 4 miles southwest of the business section of Orlando. The route is contiguous to the city limits, but actually lies in the county. The operator has been gathering data for himself that is identical but more detailed than that required by the data acquisition and analysis system. Rather than duplicate the data, it was furnished to this system in summary form. The route serves typical low- to medium-cost housing. The structures are one-story concrete block with two and three bedrooms. Several trailer courts are also served on the route. The route is approximately 10 miles long, but every house on the route is not served. In this sense, the operation is unique. Several private contractors operating under franchise from Orange County service each street in the area. The houses generally are surrounded by abundant shrubbery and in many cases had several citrus trees in the yard. Most of the streets are unpaved. There is a large percentage of older couples, whose children have grown up and left home, living in the area. Information was obtained for four days a week. Collection is made from each risidence twice a week. On Monday and Thursday, 556 residences housing approximately 1,800 persons are served, and on Tuesday and Friday, 467 residences housing approximately 1,500 persons are served. Pickup is made from any location the resident desired, and he is charged according to the distance from the curb.

Orlando Route 2 0478006009

Orlando route 2 starts just north of the business district. It covers an area of approximately 1.2 square miles, covering 0.4 square miles on Monday and Thurdasy and 0.8 square miles on Tuesday and Friday. The Orlando system is a rigidly discipline system that works 10 hour days. On household collection day, the vehicle and crew make a pass completely through the route and collect the household waste.

This waste is delivered to an incinerator approximately 1 mile from the end of the route. The vehicle and crew then return to the route, collecting yard waste that has been piled at the curb. (All household waste is collected at the back door.) The yard waste is collected; whether it is in a container or not. The truck continues through the route until it is loaded. When the vehicle is loaded, an empty vehicle is dispatched to the area. The crew takes the empty vehicle and continues to collect the yard waste until the workday is over. The driver who has delivered the empty truck then takes the loaded vehicle to the landfill approximately 8 to 10 miles away. In early spring, as many as three loads of yard waste is collected in a day from this route. This sequence is followed on Monday and Tuesday. On Wednesday, a pass is made through the complete route to collect any yard waste that has accumulated since the last collection. On Thursday and Friday only one trip is made through the route. On this trip, household waste is collected.

The houses served by the route vary from two-story lake-front mansions of well-known professional people to modest cottages of blue-collar workers. The area was developed 20 to 25 years ago and is still one of the major residential areas in the city of Orlando. The route services 400 residences, which house 1,200 people, on Monday and Thursday and 325 residences, which houses 1,000 people, on Tuesday and Friday. The route covers 725 houses on Wednesday.

Orlando Route 3 0478006010

This route is contiguous to the Orlando business district and extends to the west for approximately one mile. The area nearest the business district is a ghetto. Collection is made in this area on Tuesday and Friday. The western boundary of the route is a modest neighborhood of low to middle-income families. The route follows the same routine as that described for route 0478006010, and it serves approximately the same number of residences and residents:

400 residences, 1,200 persons, on Monday and Thursday

325 residences, 1,000 persons, on Tuesday and Friday

725 residences, 2,200 persons, on Wednesday for yead waste

The houses in the eastern portion of the route are, for the most part, wooden frame construction in very poor repair. There is very little shrubbery, but quite a few vegetable gardens; furniture in disrepair is strewn throughout the area. The east side is complsed of small concrete block houses 15 to 20 years old, but in good repair, with well-kept lawns and a profusion of semitropical shrubbery.

APPENDIX G

STANDARD METROPOLITAN STATISTICAL AREAS

Wichita Falls SMSA - Fig. 1

The Wichita Falls SMSA consists of the land in Archer and Wichita Counties in Texas. It has a population of approximately 115,000, of which approximately 95,000 live in the city of Wichita Falls. The land area in these counties is approximately 1,524 square miles. The main business are Sheppard Air Force Base, cattle, and oil fields, in that order. The average weekly wage is $130 a week for production workers. In the area, 4,126 people receive approximately $186,000 per month public assistance. The total value of assessed properly is $188 million.

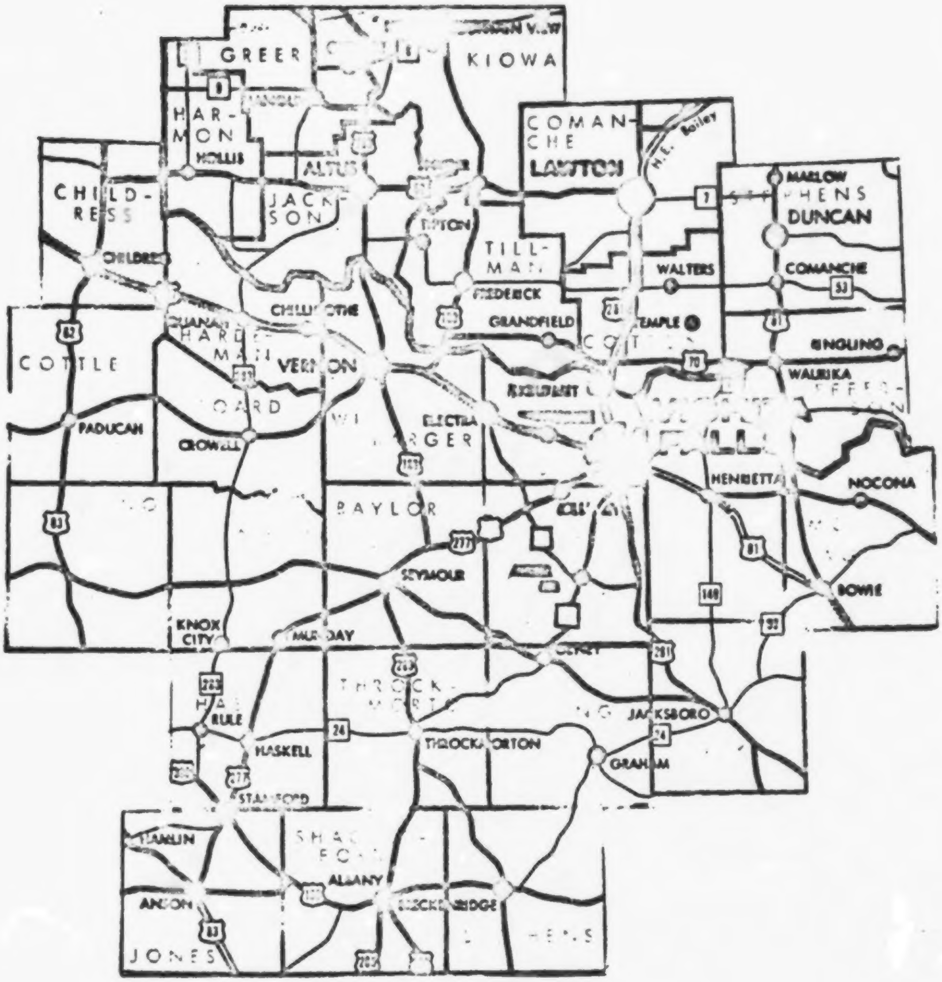
Cleveland SMSA - Fig. 2

The Cleveland SMSA encompasses 1,519 square miles, which includes all of Cuyahoga, Geauga, Lake and Medina Counties. The area is populated by approximately 2,056,000 persons (1867 estimate). The average family consists of 3.9 people, which makes a population density of 1,349 persons per square mile. These persons occupy approximately 611,600 housing units (extrapolated from 1960 data), resulting in approximately 3.32 persons per living unit. Of these units, 410,000 are single-family units, with the remainder multiple dwellings.

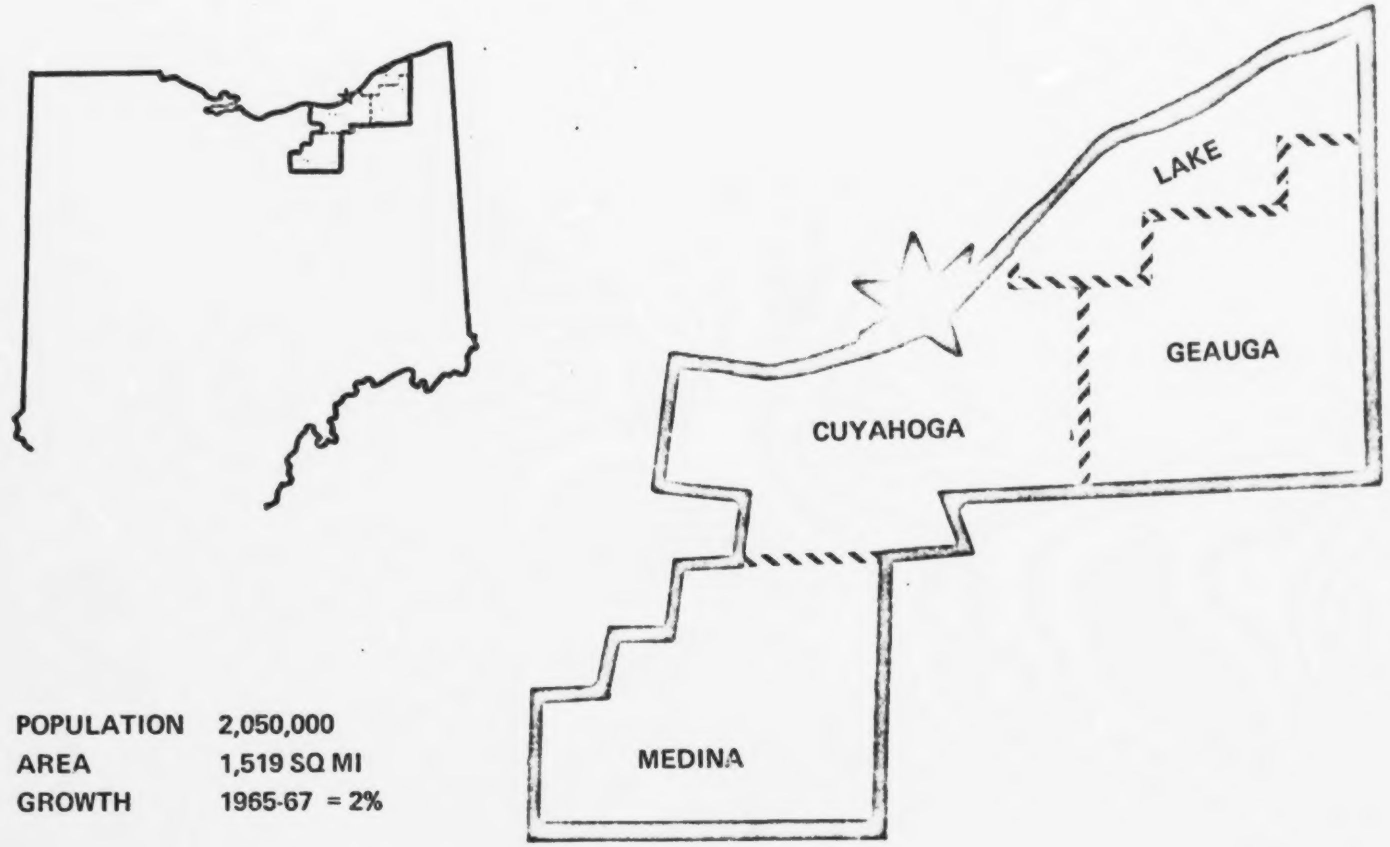
Orlando SMSA - Fig. 3

The Orlando SMSA encompasses 1,215 square miles, which includes Orange and Seminole Counties. The major population centers are Orlando, Maitland, Winter Park, Sanford, Kissimmee, and Apopka. The area is populated by approximately 382,000 people, 49.5 percent of whom live in single-family units and 46.5 percent of whom live in structures with 5 units or more. The population density is 310 persons per square mile. The citizerry depends on citrus, tourism, and the aerospace industry for its livelihood.

Figure 4 shows the location of these SMSA's imposed on a map of the United States.

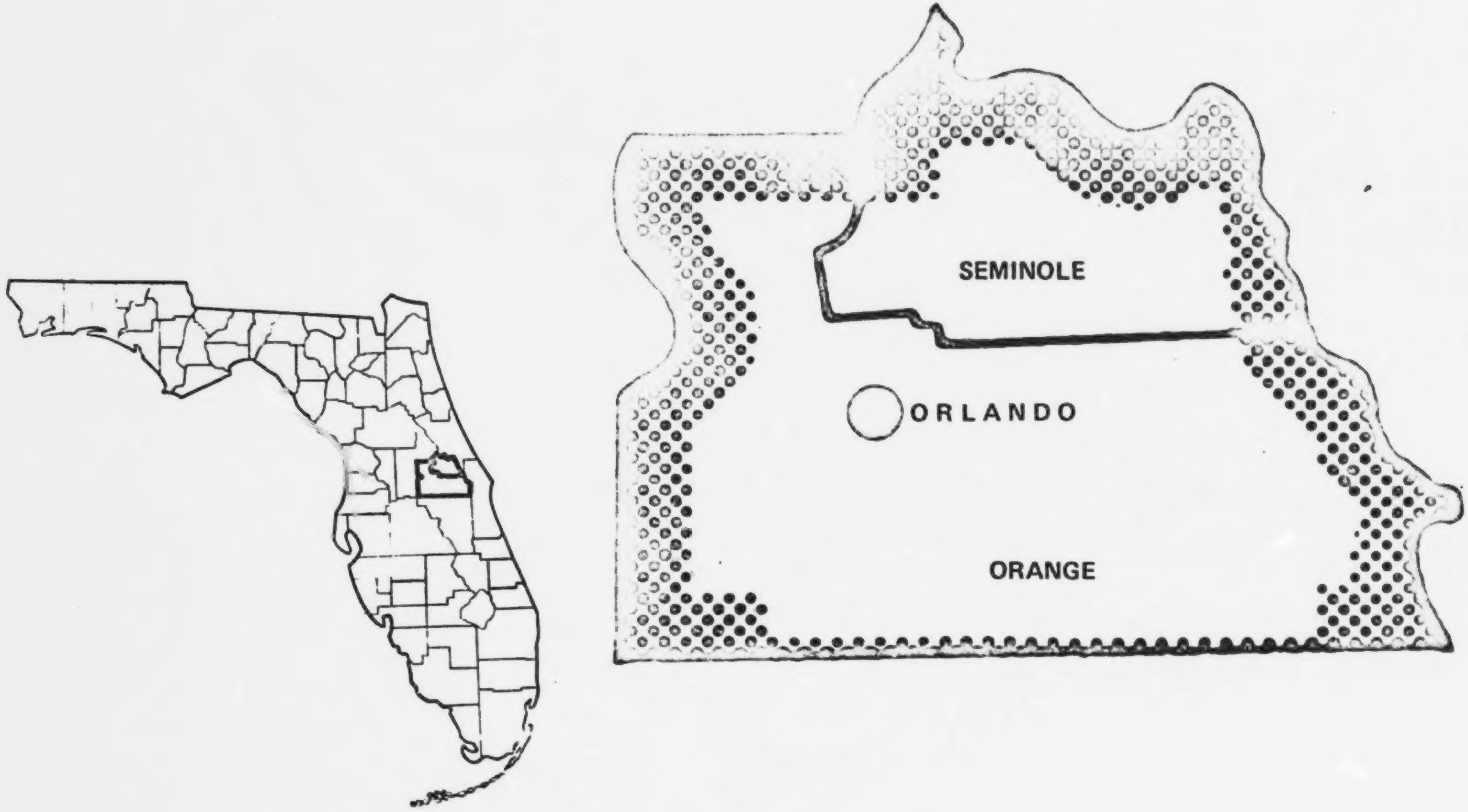

GREER
KIOWA
HAR-MON
HOLLIS
ALTUS
JACK-SON
COMAN-CHE
LAWTON
MARLOW
STEPHENS
DUNCAN
CHILD-RESS
CHILDRESS
TIPTON
TILL-MAN
WALTERS
COMANCHE
FREDERICK
GRANDFIELD
TEMPLE
RINGLING
CHILLICOTHE
QUANAH
HARDE-MAN
VERNON
WAURIKA
COTTLE
PADUCAH
CROWELL
ELECTRA
HENRIETTA
NOCONA
BAYLOR
SEYMOUR
BOWIE
KNOX CITY
MUNDAY
OLNEY
THROCK-MORTON
RULE
HASKELL
THROCKMORTON
JACKSBORO
GRAHAM
STAMFORD
HAMLIN
SHACK-FORD
ALBANY
ANSON
BRECKENRIDGE
JONES

Appendix G - Figure 1. Wichita Falls, Texas, S.M.S.A.

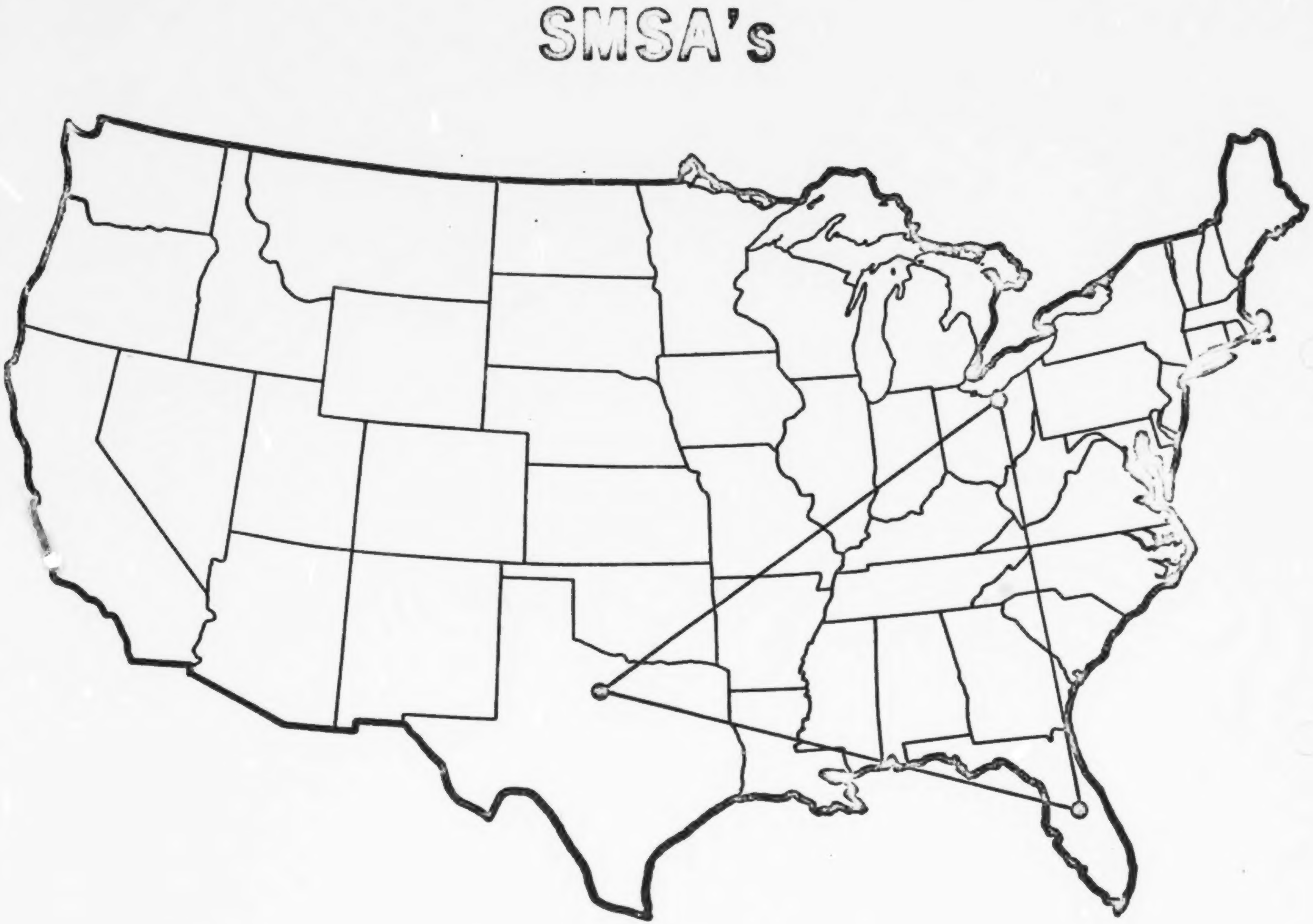

LAKE
GEAUGA
CUYAHOGA
MEDINA

POPULATION	2,050,000
AREA	1,519 SQ MI
GROWTH	1965-67 = 2%

Appendix G - Figure 2. Cleveland, Ohio, S.M.S.A.


SEMINOLE
ORLANDO
ORANGE

Appendix G - Figure 3. Orlando, Florida, S.M.S.A.



Appendix G - Figure 4. Relative Locations of S.M.S.A.'s Sampled

APPENDIX H

Physical Description of Cleveland SMSA Incinerator

Principal features of the Cleveland SMSA Incinerator are as follows:

a. Receiving Pit

Volume - (2,945 yd^3) (approx. 500-ton)

Dimensions - 159' long

20' wide approx.

25' deep

b. Cranes - 2 buckets 3 yd^3 capacity

c. Furnaces - 4 (inside dimension); Inside dimensions =

12 ft. 6 in. wide, 21 ft. long 11 ft. 10 in. high

d. Combustion chambers - (Inside dimension) =

26 ft. 6 in. long, 10 ft, 3 in. wide, 15 ft. high

e. Spray chambers - (Inside dimension) = 26 ft. 8 in. long, 9 ft. wide, 15 ft. high - 3 baffles

f. Stacks - 7 ft. ID

height above roof - 42 ft.

height above ground 67 ft. 6 in.

g. Forced draft fans - 4 ea 30 HP - 25,000 CFM air flowrate

h. Induced draft fans - 4 ea 75 HP - 79,000 CFM air flowrate

i. Miscellaneous - refuse st - 340 lb/yd^3

hoist crane speed 330 ft./min.

ash - 72 to 74 tons/24 hr/2 furnaces

j. Operation Schedule - 2 furnaces

24 one/day

5 1/2 day/week

APPENDIX I

Results of Characterization

The tabulated results of the characterizations are shown in Figures 1 and 2 of this Appendix.

While two characterizations is too small a sample to lead to sound conclusions, several interesting questions are raised by studying the figures.

The numbers at the top of the columns identify the routes from which the data was taken.

A comparison of the percentage of glass between routes 002 and 003 might lead the casual viewer to conclude that the metal and glass entries in Column 1 have been inverted. However, this was not the case. The sample from route 002 consisted of a sizeable quantity of beer and soft drink cans along with some food cans, while the same from 003 consisted of a preponderance of beverage bottles and food jars as opposed to cans.

Prior to instituting the program, considerable debate was given to determining the method to be used in locating those households having garbage disposal units. A look at the food waste category of Figure 1 reveals very quickly the kind of difference between households having a disposal unit and those that do not. Route 003 and Route 007 are known to have units in all houses. Whereas, 001 is known not to have such a unit. A study of this figure might make the observer wonder why the food waste on Route 011 and 008 are so much higher than the other routes. The characterization for 011 was done in November during or immediately after hunting season and a good many spoiled birds were in the samples. The 008 route covers an area in which citrus trees are part of the landscape. The oranges and grapefruit found in the sample were classified as food waste. A glance at the garden waste for this route would indicate that probably these items went from tree to ground to waste can.

Another interesting question might be raised by the small quantity of garden waste on route 001. This can be easily explained by those familiar with the route. The characterization samples from this route came from an area of public housing. In this area, the garden waste is removed by a county crew and does not find its way into the solid waste collection system.

A look at Figure 2 would immediately raise the question about the unusually large percentage of paper on route 001. The answer lies in the fact that the resident was disposing of wallpaper which had been removed from the walls of the house.

Paper in itself was a point of interest. There seemed to be a general correlation on the percent of paper in the waste of the households sampled. However, the type paper in samples seemed to fall into two categories. The category found in the lower income area contained mostly boxes, paper bags and packaging paper, whereas the paper in the higher income areas consisted mostly of reading materials (newspapers, magazines, etc.).

The characterization effort afforded the analyst an entry to the various systems and seemed to stimulate overall interest of the operation and management of the local system in the Pilot Solid Waste Data Acquisition and Analysis System.

ROUTE CATEGORY	1st CHARACTERIZATION PERCENT BY WEIGHT									
	002	001	003	005	011	006	012	007	008	COMP
1. Food waste	24.3	25.7	5.3	20.9	40.3	26.4	39.4	6.0	47.5	20.9
2. Paper	27.6	38.0	31.6	41.9	29.1	30.6	34.6	49.4	35.1	37.4
3. Garden waste	12.9	1.5	21.2	10.1	-	4.7	0.1	15.8	1.1	9.7
4. Plastics	3.5	5.9	2.7	4.3	2.8	3.3	3.8	2.2	1.9	3.3
5. Rubber and leather	-	1.0	3.4	-	-	0.9	0.1	-	-	0.6
6. Textiles	2.9	2.2	1.1	1.9	1.0	2.2	1.1	0.9	0.7	1.6
7. Wood	0.8	0.2	2.8	1.2	0.1	2.9	0.1	1.7	-	1.3
8. Metals	18.3	7.8	7.4	9.5	17.6	11.1	14.9	7.7	8.7	10.8
9. Glass	8.8	16.4	22.6	6.9	9.1	17.9	3.4	14.5	4.2	13.2
10. Rocks, dirt and ash	0.8	0.4	3.8	-	-	-	2.4	1.6	-	1.2
11. Fines	-	-	-	-	-	-	-	-	-	-

Appendix I - Figure 1. Table of Characterization Values - 1st Characterization

ROUTE / CATEGORY	2nd CHARACTERIZATION BY PERCENTILE OF WEIGHT											
	002	001	003	011	005	006	012	008	007	009	010	AVG
1. Food waste	23.2	10.8	9.6	6.1	13.1	16.5	6.2	28.3	19.7	50.4	13.4	14.6
2. Paper	35.1	62.8	47.4	20.9	35.1	46.5	8.9	23.4	12.4	30.3	47.9	40.2
3. Garden waste	1.3	.27	-	34.8	33.7	0.5	0.2	-	43.8	0.2	4.3	9.1
4. Plastics	9.4	1.7	3.2	1.3	2.2	1.5	-	5.5	3.7	2.8	1.8	3.1
5. Rubber and leather	2.4	2.4	0.7	0.6	0.9	1.1	-	5.8	2.0	-	-	1.4
6. Textiles	2.6	6.9	0.6	2.2	0.6	4.5	-	10.4	2.8	0.3	2.3	3.3
7. Wood	0.4	0.6	0.9	4.8	0.4	0.3	72.3	0.9	3.3	-	-	6.7
8. Metals	9.9	6.8	12.3	7.2	8.0	11.8	8.8	14.4	3.2	7.9	6.5	8.5
9. Glass	15.6	4.9	24.5	4.8	5.8	7.5	3.4	9.8	8.2	8.1	22.4	10.0
10. Rock, dirt and ash	-	0.3	0.7	17.1	-	9.8	-	1.4	0.7	-	1.4	3.3
11. Fines	-	-	-	-	-	-	-	-	-	-	-	-

Appendix I - Figure 2. Table of Characterization Values - 2nd Characterization

APPENDIX J

```
//S000716  JOB                                                                  (,C JOB 374
//            007486,W00269,007486,480309901,B1,S14,5,10),                        X
//            'W.W.WARREN    W00269',                                             X
//            CLASS=E,                                                            *
//            MSGLEVEL=(2,0),REGION=200K
// EXEC FORTGCLG
//FORT.SYSIN DD *

JOB NAME                 S000716                                   ELAPSED TIME   00.00.26
STEP NAME                   FORT     COMPLETION CODE    000000     CPU TIME       00.00.14
PROGRAM                  IEYFORT     HWM          124K,     OK     EXCP/TAPE          0/00
HIER 0                      200K     HIER 1                 OK     EXCP/DISK         11/01



JOB NAME                 S000716                                   ELAPSED TIME   00.00.18
STEP NAME                   LKED     COMPLETION CODE    000000     CPU TIME       00.00.01
PROGRAM                     IEWL     HWM          168K,     OK     EXCP/TAPE          0/00
HIER 0                      200K     HIER 1                 OK     EXCP/DISK         48/04

//GO.SYSIN DD *

JOB NAME                 S000716                                   ELAPSED TIME   00.00.14
STEP NAME                     GO     COMPLETION CODE    06D000     CPU TIME       00.00.05
PROGRAM                 PGM=*.DD     HWM          196K,     OK     EXCP/TAPE          0/00
HIER 0                      200K     HIER 1                 OK     EXCP/DISK         12/01



*******************************************************************************************
PROGRAMMER             W.W.WARRE     CHARGE NO.         007486     DATE            6/23/71
JOB STARTED AT          04.00.44     JOB ENDED AT     04.01.47     ELAPSED TIME   00.01.02
MODEL                   360/65-2     JOB NAME          S000716     CPU TIME       00.00.20
JOB PRIORITY                   1     MAX HWM         196K,  OK     TAPES/DISKS        0/ 4
HIER 0                      200K                                   HIER 1               OK
```

```
FORTRAN IV G LEVEL 1, MOD 4            MAIN               DATE = 71174          04/00/51

      DIMENSION TRUCK(4,3),PIKUP(4),DISPL(3,2),SEPR(2)
      DIMENSION DAYS(14),DAZ(14),TEMP(4),ISPAN(14)
      REAL*8 RIN(42)
      REAL*8 AID(14,35,42),AFIN,ASTA,CONT,START,FINSH,ASRT
      REAL*8  AEQT(14),AMMT(14),ATCT(14),ACSA(14),APTC(14),APRC(14)
      REAL*8 ACTV(14),TCRW(14),TCSWD(14),AEQC(14),AMMC(14),ATCC(14)
      REAL*8  APPS(14),CHECK(14)
      REAL*8 BEGIN,END
      DATA DAYS/4.0,2.0,  5.0,3*5.0,1.0,5.0,2*2.0,4*4.0/
      DATA CHECK/478004007.,478006008.,478006009.,511999004.,
     1 511002001.,511002002.,511005003.,478006010.,
     2 681001011.,681003012.,681007005.,681007006.,
     3 681007013.,681007014./
      DATA TRUCK(1,1),TRUCK(1,2),TRUCK(1,3)/%FRON%,%T LO%,%ADER%/
      DATA TRUCK(2,1),TRUCK(2,2),TRUCK(2,3)/% SID%,%E LO%,%ADER%/
      DATA TRUCK(3,1),TRUCK(3,2),TRUCK(3,3)/% REA%,%R LO%,%ADER%/
      DATA TRUCK(4,1),TRUCK(4,2),TRUCK(4,3)/%    %,%   T%,%RAIN%/
      DATA PIKUP/%CURB%,%YARD%,%ALLY%,%CCMB%/
      DATA DISPL(1,1),DISPL(1,2)/%XFER%,% STA%/
      DATA DISPL(2,1),DISPL(2,2)/%LND %,%FILL%/
      DATA DISPL(3,1),DISPL(3,2)/%INCN%,%RATR%/
      DATA SEPR/% NO%,%YES%/
      IAA = 5
      IBC = 6
      START = 70000
      FINSH = 71300
      ASTA = 00.
      AFIN  =999959999.
 1000 I = 0
      CONT = 1.
      IADD = 0
      J = 1
    1 READ(IAA,2)RIN
    2 FORMAT (F10.0,F6.0,2F3.0,F4.2,F3.0,2F5.2,3F5.0,F4.1,F4.0,F4.1,
     X F4.0,F5.2/F10.0,F6.0,F3.0,3F4.1,4F3.0,2F5.0/F10.0,F6.0,4F3.0,
     X 2F9.0,F5.3,4F4.0,F6.0)
      IF (RIN(1) - AFIN) 800,11,800
  800 IF (RIN(1)) 3,999,3
    3 IF (RIN(1) - ASTA) 1,4,4
    4 IF (RIN(1) - AFIN) 5,5,1
    5 IF (RIN(2) - START) 1,6,6
    6 IF (RIN(2) - FINSH) 7,7,1
    7 IF (RIN(1) - CONT) 8,95,8
    8 IF (I) 9,10,9
    9 ISPAN(I) = J
   10 J = 1
      I = I + 1
      IADD = IADD + 1
      CONT = RIN(1)
      WRITE(IBC,398) RIN(1),RIN(2),I,J
  398 FORMAT(1X,2F10.0,2I10)
   90 DO 92  KK = 1,42
   92 AID(I,J,KK) = RIN(KK)
      GO TO 1
   95 J = J + 1
      WRITE(IBC,398) RIN(1),RIN(2),I,J
      GO TO 90
   11 CONTINUE
```

```
0054                  ISPAN(I) = J
             C
             C  ************************************************************************
             C  THIS IS A TEST PRINT STATEMENT
0055                  WRITE(IBC,8COO)
0056            8000  FORMAT(1X,45HDATA READIN COMPLETE - OK TO STATEMENT NO. 19)
0057                  K = ISPAN(1)
0058                  BEGIN = AID(1,1,2)
0059                  END = AID(1,K,2)
0060                  IF (IADD - 1) 1500,1510,1500
0061            1500  DO 1505  I = 2,IADD
0062                  IF (BEGIN - AID(I,1,2)) 1502,1502,1501
0063            1501  BEGIN = AID(I,1,2)
0064            1502  K = ISPAN(I)
0065                  IF (END - AID(I,K,2)) 1503,1505,1505
0066            1503  END = AID(I,K,2)
0067            1505  CONTINUE
0068            1510  WRITE (IBC,1515) BEGIN,END
0069            1515  FORMAT(1H1,42HSTART DATE FOR DATA IN FOLLOWING TABLES IS,F7.0/
                     1  1H0,40HEND DATE FOR DATA IN FOLLCWING TABLES IS,F7.0)
             C
             C
             C        THIS IS THE SUMMARIZATION OF DATA RCUTINE
             C
             C
0070                  DO 60  I = 1,IADD
0071                  DO 20  II = 1,42
0072                  AID(I,32,II) = 0.
0073              20  CONTINUE
0074                  K = ISPAN(I)
0075                  DO 50  J = 1,K
             C        SUMMARIZATICN OF CREW SIZE
0076                  AID(I,32,4) = AID(I,32,4) + AID(I,J,4)
             C        SUMMARIZATICN OF HOURLY RATE
0077                  AID(I,32,5) = AID(I,32,5) + AID(I,J,5)
             C        TOTALING THE LENGTH CF ROUTE
0078                  AID(I,32,7) = AID(I,32,7) + AID(I,J,7)
             C        TOTALING THE AREA SERVED
0079                  AID(I,32,8) = AID(I,32,8) + AID(I,J,8)
             C        TOTALING OF SCHEDULE HOURS PER DAY
0080                  AID(I,32,6) = AID(I,32,6) + AID(I,J,6)
             C        TOTALING WEIGHT OF THE SOLID WASTE COLLECTED
0081                  IF (AID(I,J,11)) 25,26,25
0082              25  AID (I,32,9) = AID(I,32,9) + (AID(I,J,9) - AID(I,J,42)) +
                     1        (AID(I,J,10) - AID(I,J,42)) + (AID(I,J,11) - AID(I,J,42))
0083                  GO TO 32
0084              26  IF (AID(I,J,10)) 27,28,27
0085              27  AID(I,32,9) = AID(I,32,9) + (AID(I,J,9) - AID(I,J,42)) +
                     1       (AID(I,J,10) - AID(I,J,42))
0086                  GO TO 32
0087              28  AID(I,32,9) = AID(I,32,9) + (AID(I,J,9) - AID(I,J,42))
0088              32  CONTINUE
             C        TOTALING OF MILES FRCM POOL TO SATRT CF ROUTE
0089                  AID(I,32,12) = AID(I,32,12) + AID(I,J,12)
             C        TOTALING OF MINUTES FROM POCL TO START OF RCUTE
0090                  AID(I,32,13) = AID(I,32,13) + AID(I,J,13)
             C        TOTALING OF MILES DRIVEN WHILE ACTUALLY COLLECTING WASTE
0091                  AID(I,32,14) = AID(I,32,14) + AID(I,J,14)
```

```
C      TOTALING OF MINUTES ACTUALLY SPENT COLLECTING SOLID WASTE
       AID(I,32,15) = AID(I,32,15) + AID(I,J,15)
C      TOTALING OF THE CONSUMABLE COSTS
       AID(I,32,16) = AID(I,32,16) + AID(I,J,16)
C      TOTALING OF MILES DRIVEN TRANSPORTING SOLID WASTE TO DISPOAL SITE
       AID(I,32,20) = AID(I,32,20) + AID(I,J,20)+AID(I,J,21)+AID(I,J,22)
C      TOTALING OF TIME SPENT TRANSPORTING SOLID  WASTE TO DISPOAL SITE
       AID(I,32,23) = AID(I,32,23)+AID(I,J,23)+AID(I,J,24)+AID(I,J,25)
C      TOTALING OF THE NUMBER OF RESIDENCE SERVED
       AID(I,32,27) = AID(I,32,27) + AID(I,J,27)
C      TOTALING OF THE NUMBER OF PEOPLE SERVED
       AID(I,32,28) = AID(I,32,28) + AID(I,J,28)
    50 CONTINUE
    60 CONTINUE
C      ALL TOTALING OPERATIONS HAVE BEEN COMPLETED
C      PERFORM ALL NECESSARY CALCULATIONS
       DO 150  I = 1,IADD
C      FIND OUT HOW MANY DAYS OF DATA IS COLLECTED EACH WEEK ON THIS ROUTE
       DO 108  II = 1,14
       IF(AID(I,1,1) - CHECK(II)) 108,105,108
   105 DAZ(I) = DAYS(II)
       GO TO 110
   108 CONTINUE
C      IF U FALL THRU HERE THE CONTROL NO. HAS NOT BEEN PROGRAMMED YET
       WRITE(IBC,109)
   109 FORMAT(29H1NO MATCH THIS CONTROL NUMBER)
       STOP 109
   110 CONTINUE
       DUMM = ISPAN(I)
       HELPP = DUMM / DAZ(I)
       HELP = HELPP * AID(I,1,40)
C      COMPUTE AVERAGE CREW SIZE
       AID(I,33,4) = AID(I,32,4) / DUMM
C      COMPUTE AVERAGE HOURLY RATE
       AID(I,33,5) = AID(I,32,5) / DUMM
C      COMPUTE HOURS WORKED PER MAN PER WEEK WHILE DATA WAS BEING COLLECTED
       AID(I,33,6) = AID(I,32,6) / HELPP
C      COMPUTE AVERAGE LENGTH OF ROUTE PER DAY
       AID(I,33,7) = AID(I,32,7) / DUMM
C      COMPUTE SQUARE MILES CONTAINED IN THE WEEKLY ROUTE
       AID(I,33,8) = AID(I,32,8) / HELP
C      COMPUTE AVERAGE WEIGHT COLLECTED PER DAY
       AID(I,33,9) = AID(I,32,9) / DUMM
C      COMPUTE NUMBER OF PEOPLE SERVED ON ROUTE
       AID(I,33,28) = AID(I,32,28) / HELP
C      COMPUTE NUMBER OF RESIDENCES SERVED ON ROUTE
       AID(I,33,27) = AID(I,32,27) / HELP
C      COMPUTE QTY GENERATED PER PERSON PER CALENDAR DAY
       AID(I,33,10) = AID(I,32,9) / (HELPP * 7. * AID(I,33,28))
C      COMPUTE QTY GENERATED PER RESIDENCY PER CALENDAR DAY
       AID(I,33,11) = AID(I,32,9) / (HELPP * 7. * AID(I,33,27))
C      COMPUTE AVERAGE MILEAGE FROM POOL TO START OF ROUTE
       AID(I,33,12) = AID(I,32,12) / DUMM
C      COMPUTE AVERAGE NUMBER OF MINUTES FROM POOL TO START OF ROUTE
       AID(I,33,13) = AID(I,32,13) / DUMM
C      COMPUTE AVERAGE MILES DRIVEN COLLECTING PER DAY COLLECTING
       AID(I,33,14) = AID(I,32,14) / DUMM
C      COMPUTE AVERAGE MINUTES DRIVEN COLLECTING PER DAY COLLECTING
```

```
0126                AID(I,33,15) = AID(I,32,15) / DUMM
          C         COMPUTE CONSUMABLE COST PER OPERATING MINUTE
0127                AID(I,33,16) = AID(I,32,16) / (AID(I,32,13) + AID(I,32,15) +
                   1  AID(I,32,23))
          C         COMPUTE AVERAGE DISTANCE TRANSPORTING PER DAY COLLECTING
0128                AID(I,33,20) = AID(I,32,20) / DUMM
          C         COMPUTE AVERAGE TIME TRANSPORTING PER DAY COLLECTING
0129                AID(I,33,23) = AID(I,32,23) / DUMM
          C         COMPUTE TIME SPENT COLLECTING PER RESIDENCY PER WEEK
0130                TCRW(I) = (AID(I,32,15) / HELP) / AID(I,33,27)
          C         COMPUTE COST OF VEHICLE PER OPERATING MINUTE
0131                AID(I,33,36) = AID(I,1,36) / (AID(I,1,35) * 60.)
          C         COMPUTE TOTAL CREW WAGES PER MINUTE
0132                AID(I,33,3) = AID(I,33,4) * AID(I,33,5) / 60.
          C         COMPUTE AVG COST TO TRAVEL FROM PCCL TO START OF ROUTE
0133                ACTV(I) = (AID(I,33,36) + AID(I,33,3) + AID(I,1,37) +
                   1  AID(I,33,16)) * AID(I,33,13)
          C         COMPUTE AVERAGE EQUIPMENT COST TO COLLECT PER DAY
0134                AEQC(I) = (AID(I,33,36) + AID(I,1,37) + AID(I,33,16)) *
                   1  AID(I,33,15)
          C         COMPUTE AVERAGE MANPOWER COST TO COLLECT PER DAY
0135                AMMC(I) = AID(I,33,3) * AID(I,33,15)
          C         COMPUTE TOTAL COST TO COLLECT PER DAY
0136                ATCC(I) = AEQC(I) + AMMC(I)
          C         COMPUTE AVERAGE EQUIPMENT COST TO TRANSPORT PER DAY
0137                AEQT(I) = (AID(I,33,36) + AID(I,1,37) + AID(I,33,16)) *
                   1  AID(I,33,23)
          C         COMPUTE AVERAGE MANPOWER COST TO TRANSPORT PER DAY
0138                AMMT(I) = AID(I,33,3) * AID(I,33,23)
          C         COMPUTE TOTAL COST TO TRANSPORT PER DAY
0139                ATCT(I) = AEQT(I) + AMMT(I)
          C         COMPUTE AVERAGE SKEDULED WORK DAY PER MAN
0140                AID(I,33,2) = AID(I,32,6) / DUMM
          C         COMPUTE TOTAL COST OF SOLID WASTE OPERATION PER DAY - PRODUCTIVE
0141                      TCSWO(I) = ACTV(I) + ATCC(I) + ATCT(I)
          C         COMPUTE PRODUCTIVE + INCENTIVE COST OF SOLID WASTE OPERATION PER DAY
0142                IF (AID(I,33,2) * 60. - AID(I,33,13) - AID(I,33,15)
                   1  - AID(I,33,23)) 125,125,126
0143            125 AID(I,33,18) = TCSWO(I)
0144                GO TO 127
0145            126 AID(I,33,18) = TCSWO(I) + ((AID(I,33,2) * 60. - AID(I,33,13)
                   1   - AID(I,33,15) - AID(I,33,23)) * AID(I,33,3))
          C         COMPUTE RATIO PRODUCTIVE TO PRODUCTIVE PLUS INCENTIVE
0146            127 AID(I,33,26) = TCSWO(I) / AID(I,33,18)
          C         COMPUTE COST TO SERVE A SQUARE MILE FOR ONE WEEK
0147                ACSA(I) = AID(I,33,18) * DAZ(I) / AID(I,33,8)
          C         COMPUTE LENGTH OF ROUTE ONCE OVER
0148                AID(I,33,21) = DAZ(I) / AID(I,1,40) * AID(I,33,7)
          C         COMPUTE LIFE EXPECTANCY OF VEHICLE IN YEARS
0149                AID(I,33,35) = AID(I,1,35) / 2080.
          C         COMPUTE MAINTENANCE COST PER OPERATING HOUR
0150                AID(I,33,37) = AID(I,1,37) * 60.
          C         COMPUTE CONSUMABLE COST PER OPERATING HOUR
0151                AID(I,33,19) = AID(I,33,16) * 60.
          C         COMPUTE COST PER TON COLLECTED
0152                APTC(I) = AID(I,33,18) / (AID(I,33,9) / 2000.)
          C         COMPUTE COST PER PERSON SERVED PER WEEK
0153                APPS(I) = AID(I,33,18) * DAZ(I) / AID(I,33,28)
```

```
            C      COMPUTE COST PER RESIDENCY SERVED PER WEEK
 0154              APRC(I) = AID(I,33,18) * DAZ(I) / AID(I,33,27)
 0155          150 CONTINUE
            C  PRINT ROUTINE FOR VEHICLE CREW DETAILED REPORT
 0156              WRITE(IBC,232)
 0157              DO 230  I = 1,IADD
            C      DETERMINE KIND OF TRUCK BEING USED ON THIS ROUTE
 0158              ID = AID(I,1,32)
 0159              IF (ID - 1) 220,222,222
 0160          220 WRITE (IBC,221)
 0161          221 FORMAT(32H1ERROR 221 - CODE NOT PROGRAMMED)
 0162              STOP 220
 0163          222 IF (ID - 4) 225,225,220
 0164          225 TEMP(1) = TRUCK(ID,1)
 0165              TEMP(2) = TRUCK(ID,2)
 0166              TEMP(3) = TRUCK(ID,3)
 0167              WRITE(IBC,231)AID(I,1,1),TEMP(1),TEMP(2),TEMP(3),AID(I,1,33),
                 1  AID(I,1,34),
                 2  AID(1,33,35),AID(I,1,36),AID(I,33,37),AID(I,33,19),AID(I,33,4),
                 3  AID(I,33,5),AID(I,33,6)
 0168          230 CONTINUE
 0169          231 FORMAT(1X,F11.0,2X,3A4,1X,F4.0,6HCU YDS,F5.0,F7.0,F11.0,F12.3,4X,
                 1  F11.3,F11.0,F9.2,F11.1)
 0170          232 FORMAT(1H1,30(4H****)//37X,30HVEHICLE - CREW DETAILED REPORT//
                 1  1X,30(4H****)//1X,11HCONTROL NO.,31X,23HVEHICLE CHARACTERISTICS,
                 2  31X,20HCREW CHARACTERISTICS/18X,4HTYPE,8X,4HSIZE,5X,3HAGE,2X,
                 3  8HLIFE EXP,3X,4HCOST,3X,13HMAINT C/OP HR,2X,13HCONSU C/OP HR,
                 4  4X,4HSIZE,2X,9HHRLY RATE,2X,10HWRK HRS/WK/)
            C
            C  PRINT ROUTINE FOR ROUTE WASTE DETAILED REPORT
 0171              WRITE(IBC,252)
 0172              DO 250  I = 1,IADD
 0173              ID = AID(I,1,38)
 0174              IF(ID - 1) 240,242,242
 0175          240 WRITE(IBC,241)
 0176          241 FORMAT(32H1ERROR 241 - CODE NOT PROGRAMMED)
 0177              STOP 240
 0178          242 IF (ID - 4) 243,243,240
 0179          243 TEMP(1) = PIKUP(ID)
 0180              ID = AID(I,1,39)
 0181              IF(ID - 1) 240,244,244
 0182          244 IF (ID - 3) 245,245,240
 0183          245 TEMP(2) = DISPL(ID,1)
 0184              TEMP(3) = DISPL(ID,2)
 0185              ID = AID(I,1,41)
 0186              IF (ID - 1) 240,246,246
 0187          246 IF (ID - 2) 247,247,240
 0188          247 TEMP(4) = SEPR(ID)
 0189              WRITE(IBC,251)AID(I,1,1),AID(I,33,7),TEMP(1),TEMP(2),TEMP(3),
                 1  AID(I,1,40),AID(I,33,8),TEMP(4),AID(I,33,9)
 0190          250 CONTINUE
 0191          251 FORMAT (1X,F11.0,F9.0,8X,A4,4X,2A4,F6.0,3H/WK,F10.3,6X,A3,
                 1    4X,F11.0)
 0192          252 FORMAT (1H1,30(4H****)//45X,21HROUTE DETAILED REPORT//
                 1  1X,30(4H****)//1X,11HCONTROL NO.,29X,21HROUTE CHARACTERISTICS/
                 2  14X,10HLENGTH/DAY,2X,9HTYPE SERV,2X,8HDISCG PT,2X,8HSCHEDULE,2X,
                 3  8HAREA SVD,2X,9HSEPR REQD,2X,14HAVG WEIGHT/DAY/)
            C
```

```
             C  PRINT ROUTINE FOR OPERATIONS DETAILED DATA
 0193             WRITE(IBC,272)
 0194             DO 270  I = 1,IADD
 0195             WRITE(IBC,271)AID(I,1,1),AID(I,33,12),AID(I,33,13),AID(I,33,14),
                1  AID(I,33,15),AID(I,33,20),AID(I,33,23),TCRW(I),AID(I,33,11),
                2  AID(I,33,10)
 0196         270 CONTINUE
 0197        271  FORMAT (1X,F11.0,9F11.2)
 0198         272 FORMAT(1H1,30(4H****),//42X,26HOPERATIONS DETAILED REPORT //
                 1  1X,30(4H****)//
                 21X,112HCONTROL      PCOL TO START OF ROUTE       COLLECTION
                 3 TRANSPORTATION       TIME COL/     QTY GEN/    QTY GEN//16X,98HDISTA
                 4NCE     TIME       DISTANCE     TIME        DISTANCE     TIME      RESID
                 5SVD   RESID/DAY   PERSON/DAY/)
             C
             C  PRINT ROUTINE COST BREAKDOWN REPORT
 0199             WRITE(IBC,292)
 0200             DO 290  I = 1,IADD
 0201             WRITE(IBC,291)AID(I,1,1),ACTV(I),AEQC(I),AMPC(I),ATCC(I),AEQT(I),
                1  AMMT(I),ATCT(I),AID(I,33,26),AID(I,33,18),ACSA(I)
 0202         290 CONTINUE
 0203         291 FORMAT (1X,F11.0,7F11.2,F11.3,F13.2,F10.2)
 0204         292 FORMAT (1H1,31(4H****)//45X,31HCOST BREAKDOWN DETAILED REPORT //
                 1  1X,31(4H****)//
                 21X,123HCONTROL         COST TRAV    EQ COST     MP COST   TOT COST   EQ
                 3COST TO    MP COST     TOT COST    RATIO PROD                    COST/SQ /
                 4  11X,                                                                 92H
                 5     TO ROUT/D    COL/DAY     COL/DAY TO COL/DAY  TRANSP/DA  TRANSP/D
                 6A  TRANSP/DA  TO PAID TIME,2X,20H COST/DAY   MILE/WEEK /)
             C
             C  PRINT ROUTINE FOR POPULATION CHARACTERISTICS
 0205             WRITE(IBC,312)
 0206             DO 310  I = 1,IADD
 0207             WRITE(IBC,311)AID(I,1,1),AID(I,1,26),AID(I,33,27),AID(I,33,28)
 0208         310 CONTINUE
 0209         311 FORMAT(1X,F11.0,3F10.0)
 0210         312 FORMAT(1H1,12(4H****)//10X,27HPOPULATION CHARACTERISTICS //
                 1  1X,12(4H****)//
               . 2 1X,41HCONTROL NO.     ECON LV  RES SVD  PEOP SVD/)
             C
             C
             C
             C
 0211         84    WRITE(IBC,87)
 0212             DO 86  I = 1,IADD
 0213             WRITE(IBC,85) AID(I,1,17),AID(I,33,28),AID(I,33,21),AID(I,33,9),
                1  AID(I,33,18),AID(I,33,26),AID(I,33,10),APTC(I),APPS(I),APRC(I)
 0214          85 FORMAT (1X,F11.0,F12.0,F13.2,F13.0,F12.0,F14.3,F13.2,F11.2,2F13.2)
 0215         86    CONTINUE
 0216          87 FORMAT (1H1,32(4H****)//57X,15HSUMMARY REPORT // 1X,32(4H****)//
                 1                                                 1X,128HCONTROL        PEOPLE
                 2 S/WK  LGT OF ROUT   WEIGHT/DAY   COST/DAY  RATIO PROD/PD  QTY GEN
                 3/P/D  COST/TON  C/PER SVD/WK  C/RES SVD/WK /)
 0217              WRITE (IBC,990)
 0218         990 FORMAT(1H1)
 0219              GO TO 1000
 0220         999 STOP
 0221              END
```